CHEM. LIBRARY APR 12 1921

GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

VOL. CLIII. No. 3020.] LONDON, MARCH 30, 1921. [73RD YEAR. PRICE 1s.

OXIDE OF IRON
SPENT OXIDE

GAS PURIFICATION AND CHEMICAL CO., Ltd.
PALMERSTON HOUSE, LONDON, E.C.2.
Telegrams: "PURIFICATION, LONDON."
Telephone: 9144 LONDON WALL.

ALUMINIUM CANNOT RUST.

WRITE FOR .. GAS LEAFLET

THE BRITISH ALUMINIUM CO., LTD.,
109, Queen Victoria Street, London.

R. & W. HAWTHORN LESLIE & CO., LTD.
In Stock.
TANK LOCOMOTIVES
Always In Progress.
Locomotive & Marine Engineers & Shipbuilders,
NEWCASTLE-ON-TYNE.

INTERMITTENT VERTICALS.
Adopted all over the World.
Vertical Gas Retort Syndicate LTD.,
17, VICTORIA ST., WESTMINSTER, S.W.
Sole Agents for Australasia
JAMES HURLL & CO., LTD., SYDNEY.

TORBAY METER ENAMEL.
The TORBAY PAINT CO.,
26/28, Billiter St., LONDON, E.C. 3.
39/41, Old Hall St., LIVERPOOL.

GAS & CANNEL COAL CONTRACTORS.
WM. F. RUSSELL & SONS.
Telegrams for all Offices: "MONKLAND."
GLASGOW: 90, Mitchell Street;
NEWCASTLE: Exchange Buildings;
HULL: Exchange Buildings, Lowgate;
LIVERPOOL: 5, Castle St.; &
SWANSEA: Atlantic Buildings.

JAMES McKELVIE & CO.
Coal Owners,
Gas and Steam Coal Contractors,
17, RUTLAND SQUARE, EDINBURGH.
59, MARK LANE, LONDON, E.C.
GUILDHALL CHAMBERS, SANDHILL, NEWCASTLE-ON-TYNE.
24, CHAPEL STREET, LIVERPOOL.
ESTABLISHED 1845.

W. PARKINSON & CO.
(Incorporated in Parkinson and W. & B. Cowan, Ltd.),
LONDON & BIRMINGHAM.
(See Advertisement p. 792).

STEWARTS AND LLOYDS, LIMITED, 41, OSWALD STREET, GLASGOW. BROAD STREET CHAMBERS, BIRMINGHAM.
TUBES & FITTINGS for Gas, Steam, Water, &c.

GEORGE GLOVER & CO., LTD.,
DRY GAS METER MANUFACTURERS.
Agents for the Patent "M & M" SELF-LOCKING SLOT-METER PADLOCK.

The STRENGTH and SECURITY of the "M & M" Lock depend not upon its EXTERNAL SHAPE, which has been imitated in various quarters, but upon the SPECIAL CONSTRUCTION of its INTERNAL MECHANISM.
The special mechanism, consisting of a sliding bolt fitted with TWO STUMPS and DOUBLE-ACTION LEVERS, is FULLY PATENTED.

See that each lock is stamped **M & M,** *and beware of inferior imitations.*

LONDON: *RANELAGH WORKS, ROYAL AVENUE, CHELSEA, S.W.3.*
TELEPHONE: 1140 Kensington.
WIRE: "Dry Meters, 'Phone, London."

LEEDS: *9, DEWSBURY ROAD.*
TELEPHONE: No. 26463
WIRE: "Meters, Leeds."

MANCHESTER: *GAYTHORN METER WORKS, EASTON STREET.*
'PHONE: No. 6898 City. WIRE: "Slot, Manchester."

J. & J. BRADDOCK

(Branch of Meters Limited),

GLOBE METER WORKS,

Telegrams: "Braddock, Oldham." Telephone 815. **OLDHAM,**

AND

45 & 47, WESTMINSTER BRIDGE ROAD,

Telegrams: "Metrique, Lamb London." Telephone 2412 Hop. **LONDON, S.E. 1.**

MANUFACTURERS OF HIGH-CLASS

GAS STATION METERS.

BRADDOCK'S

STATION GOVERNORS

AND

RETORT-HOUSE GOVERNORS.

IMPROVED

WET & DRY GAS METERS

OF BEST QUALITY.

BRADDOCK'S PATENT

"SLOT" METERS.

FULL PARTICULARS ON APPLICATION.

TELEGRAMS "SEAWARD, HULL." TELEPHONE: 5571 CENTRAL.

ARTHUR WHARTON & CO.

EXPORTERS OF

GAS, FURNACE & FOUNDRY

COKE, COAL TAR & PITCH.

HULL.

THE GLENBOIG UNION FIRE-CLAY Co. Ltd.

GAS-RETORTS, HORIZONTAL, INCLINED, and VERTICAL, to New Standard Specification.

WORKS: Glenboig, Lanarkshire.

OFFICES: 48, WEST REGENT ST., GLASGOW.

58 FIRST AWARDS At International and Home Exhibitions, including Grand Prize at Brussels, 1910.

In every case the highest award given for Fire Clay Goods.

The Glenboig Bricks, Blocks, and Retorts combine, in the highest degree, the qualities of not melting, and not splitting, when subjected to the highest heats and sudden changes of temperature, and are, in consequence, found to be economical, even in districts where the local bricks can be had at half the price.

B DONKIN D

DONKIN

for

HIGH-PRESSURE GAS PLANTS

ROTARY AND RECIPROCATING COMPRESSORS :: DISTRICT AND SERVICE GOVERNORS :: PATENT DOUBLE FACED VALVES.

THE BRYAN DONKIN COMPANY, LTD.,

Head Offices & Works, **CHESTERFIELD.**

LONDON OFFICE: 3, VICTORIA STREET, WESTMINSTER, S.W. 1.

Chesterfield Telephone No. 84.
London Telephone No. 5358 Victoria.

Chesterfield Telegrams, "Donkin, Chesterfield."
London Telegrams, "Donkin, Vic. London."

B CHESTERFIELD D

GAS JOURNAL

LIGHT ✂ HEAT ✂ POWER ✂ BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON, E.C. 4.

VOL. CLIII., No. 3020.] WEDNESDAY, MARCH 30, 1921. [73RD YEAR.

EDITORIAL NOTES.

The First Therm Orders.

FROM the reading of the meters at the end of this and the June quarter, a good number of gas undertakings will be transferring their operations to the heat-unit basis under the Gas Regulation Act. The first batch of Orders has been issued; and, on application to the Director of Gas Administration at the Board of Trade (Mr. H. C. Honey), he has courteously supplied us with copies for the information of the gas industry as to what has been so far done. We are printing the Gas Light and Coke Company's Order in full, as the other Orders are *literatim* the same, save in respect of the clause dealing with the standard or maximum prices per therm. The standard or maximum prices allowed in the other instances are quoted in the review succeeding the reproduction of the Gas Light Order. It will be seen that undertakers are limited to three months within which they are to "declare" the calorific value of the gas they are going to supply. Such notice may be given immediately in the case of recipients of these Orders, seeing that a "declared date" is mentioned, from which the charges to consumers may be those authorized for thermal units; but such charges cannot come into force until after the first reading of meters subsequent to the "declared "date." From then all existing prescriptions as to price and illuminating or calorific values are cleared away, and the new ones take their place.

As to the standard prices allowed, there is evidence that the Director of Gas Administration and his staff have gone into the statistics as to actual and estimated costs with scrupulous care. As will be seen by those who are sufficiently interested to turn to the notices of the applications that have been from week to week published in the news columns of the "JOURNAL," and to compare the prices asked with those allowed, the standard or maximum prices sought have in the majority of cases only suffered decline by fractions of a penny. But there is one instance where the price per therm applied for is the one allowed. That is Frodsham; and the price is 1s. 8d. The worst drop is Ashton, which has come down from 19d. to 16d. But fractions of a penny or a penny and a fraction comprise the curtailments of the remainder of the applications.

In the operation of the sliding-scale, we see that the proposal of Mr. H. E. Ibbs has been adopted by the Board of Trade; and $\frac{1}{5}$d. per therm is being substituted as the equivalent of 1d. per 1000 c.ft. in price movements for the purpose of calculating dividends. This will produce both simplicity and uniformity in this respect. At the initial stage, it may be that trading during part of a half year [or year as the case may be] will be, before the introduction of the therm price, at a charge per 1000 c.ft. In such cases provision is made, in respect of the calculation for dividend purposes, for the conversion of the per 1000 c.ft. charge into a charge per therm. This is an example: "For the purpose of ascer- "taining the authorized rate of dividend for the half year in "which the declared date occurs, the price charged per "1000 c.ft. during that part of the half year (if any) before "the declared date shall be rendered into the equivalent "price per therm by dividing it by $4\frac{4}{5}$d." The divisor, as will be seen in the review elsewhere, varies in the different cases.

The only other clause which calls for notice is the one as to pressure. What appears in the Orders is the determination of the Board, as the result of the inquiry (early last January) which was instituted into pressures at the instance of the railway companies. It will be remembered that the railway companies wanted a sliding-scale of pressure based on calorific power. The Gas Regulation Act proposes a minimum permissible pressure of 2 inches under specified conditions, quite irrespective of calorific power. But the railway companies asked the Board of Trade to rule in effect that there should be a datum-line at 500 B.Th.U.; that at this calorific power the minimum pressure should be 2 in.; and that for every drop of 25 B.Th.U., the minimum pressure should be increased by 1-10th. Seeing that legislation has been on the 15-10ths basis with 500 B.Th.U. gas, and that experience has proved this to be absolutely satisfactory, the proposal of the railway companies was altogether unfair. The Board, however, have adopted a line of action in the matter with which the gas industry will not be prepared to quarrel. The prescribed minimum permissible pressure in the Act stands for all declared calorific powers down to 350 B.Th.U.; and for calorific powers between 350 and 300 B.Th.U., the minimum permissible pressure is to be 2·5 inches. Should the declared calorific power fall below 300 B.Th.U., then the minimum permissible pressure is to be at a figure to be prescribed by the Gas Referees, but not less than 3 in. We do not think the Referees need contemplate being troubled over this matter—at any rate for a very long period ahead. What may come is hardly worth even speculating over at the moment. Under the railway companies' proposals, the 2·5 in. would have been reached at 375 B.Th.U.; but now it will not be reached until 350 B.Th.U. is the declared value. The difference so far as the gas industry is concerned is that the 2 in. permissible minimum pressure holds good for all calorific powers down to 350 B.Th.U.

The first Orders will be, in our opinion, accepted throughout the industry as evidence of extreme care and fairness in adjudication. To say the least, it is a complicated task, and anything but an enviable one.

Gas Coal Prices and Contracts.

THE reports from the different coalfields indicate a pretty clear line of policy on the part of buyers of gas coal; and if a fairly unanimous procedure means anything, it is that the line of policy now being pursued is the right one. In a matter of this kind, with the future so nebulous, one has, of course, to take certain risks; but the general economic conditions, and the position of the coal trade itself, encourage the belief that it cannot possibly right itself by the maintenance of prices, but that by some means they will have to come down. This is the opinion; and it is the one that is guiding the actions of gas coal buyers just now. At the same time, it is recognized that price reduction rests on factors which, in view of the miners' deep concern in them, are of a critical nature. Wages will have to be reduced; but it is not upon this alone that any material lowering of coal prices can come about, because coal is now being sold at a loss, which last month amounted to no less than 6s. per ton, or about 4d. per ton more than in January. This 6s. does not include provision for depreciation, interest on debentures and other loans, capital adjustments under the Finance Act, and the profits to which the owners are entitled under the Coal Mines Emergency Act of last year. Thus the sum of loss (whatever it is) has to be made up before there can be a general decline in the price of coal. Therefore, to lower the price, there must be not only a cut in wages, but an increased production per man. To appreciate this, one has only to be told that, while the costs of production have risen since 1913 by 25s. $5\frac{3}{4}$d. per ton, the output per person engaged has fallen by an average of 69 tons. The figures here given are all average ones. The losses vary in different coal areas from about 4s. to 18s. 1d.

per ton in South Wales; and as the losses per ton increase, so the production per person engaged decreases. Last month there were two areas that actually showed a few pence profit per ton. These were the Yorkshire field and the Derby, Notts, and Leicester area; but in these two fields, the highest productions per man were obtained.

Of course, the owners cannot be expected to sell at a loss. This would mean bankruptcy; so it is fairly clear that, lower prices depending upon the two conditions referred to, much reduced prices cannot be expected for the large and better-class coals for some time to come. The prospects are that certain high-class varieties will actually increase in price; and that quality will take a larger part in the immediate future in deciding the amount of reduction of the other varieties. Some collieries we know have already offered business at somewhat lower prices than those now ruling. It is recognized by the coal owners that gas undertakings will in future be able to purchase where they please, and that they will go to the districts that best make it worth their while. It will largely depend on the costs of production and the output per man which areas are in the most favourable position for competing for business. What the reports from the different fields indicate is that gas undertakings (although some by advertisement and in other ways have been making inquiries) are not showing any disposition to hurry in entering into contracts at fixed prices—the view being that prices will be lowered progressively. This is only an opinion; and, of course, there is the risk, which most undertakings seem prepared to take. But whenever contracts are now entered into, it will be advisable to ensure the inclusion of the "fall" clause, so as to be on the safe side. Another view is that contracts should not be made too far ahead. Those that are being entered into are of a conditional character. But there is no keenness with the days drawing-out, the domestic heating season coming to an end, and the big industrial decline. From most districts, however, comes intelligence of a pretty good business in the open market—especially in gas nuts. This appears to be largely precautionary buying and stocking against any acute labour trouble. There is trade depression, unemployment, and the wages difficulty; and there are extremists who know they will lose their positions if they abandon eccentricity for sapience. Precaution and a disinclination to contract far ahead without good safeguards as to future lower prices, constitute the gas-coal buying policy to-day.

Threatened Overcrowding at Leeds University.

There is not a single part of the annual report [published last week] of Prof. J. W. Cobb, Livesey Professor at the Leeds University, that does not give satisfaction. The Department of Coal Gas and Fuel Industries is exceptionally busy, because the claims upon it—both instructional and investigating—are increasing. This is gratifying, as is also the fact that the students as they pass out into the world are being received into practice in positions of considerable responsibility. As to the research work in the department, we of the gas industry know it to be of high intrinsic value, and that certain sections of it have operated very materially to the advantage of the gas industry in connection with the revolutionizing plans that originated with the Board of Fuel Research. Through the instrumentality of the Board of Trade, the plans resulted in the passing of the Gas Regulation Act, which has conferred so much liberty on the industry in fashioning the future ways of its progress. Among other work that is proceeding at the present time for the industry is an experimental investigation into the reliability of continuously recording calorimeters—a matter which is also being explored (as was seen last week) by the Board of Fuel Research. This is a question of both urgency and importance for the industry; and so we are glad to see this independent work taking place, as it will enable the industry to speak authoritatively and critically from its own point of view respecting the relative values and virtues of the instruments. The industry asks nothing more than that it should be allowed to start off upon the new lines of operation and control with the best instrument and methods available. The capacity of the department for more extended research is being augmented by the experimental plant now being erected, through the generosity of Mr. Henry Woodall; and, through the liberality of Messrs. Woodall-Duckham, the department will before long be in possession of a specially designed silica vertical retort unit, in which carbonization or complete gasification in a current of steam, oxygen, or other gas can be carried out at high or low temperature. Other firms are also interesting themselves in subsidiary parts of the plant.

This is all very satisfactory. But there is a matter of very pressing importance that we want to emphasize, and to suggest that it should receive the earnest consideration of the gas and associated fuel industries. The gas industry has been urged over and over again to apply still greater chemical control and supervision to its various processes. Economical progress demands that this shall be so; the new statute under which the industry will before long be operating will make such control imperative. Hitherto lack of specially trained men has been a reason for the industry's not being permeated by such control. The deficiency will be gradually remedied; but we are faced with the fact that the department at Leeds is menaced with overcrowding. The fact in one sense is satisfactory; in another, disturbing. We are glad to find that more young men destined for industry appreciate the value to them of a scientific training, and have sufficient confidence that it will carry them into positions of greater responsibility, which will command due reward. But the position is also disturbing, inasmuch as it will be a matter for profound regret if, through want of accommodation, candidates for entry have to be turned from the doors of the department. Prof. Cobb says in his report that the entries for 1920-21 show that the extreme limit of accommodation is being reached. At any time decision may have to be made as to which of two alternative courses shall be pursued: The incurring of the expense of extension, or the making of a severe scrutiny of the comparative claims of candidates for entry, with a view to the limitation of numbers. The entries of new students in October, 1919, brought the number up to 28, and those of 1920 to 41. First-year students in due course reach their second year; and so, looking forward, it is quite obvious that the accommodation will be inadequate for the session 1921-22. Thus the problem arises as to the provision of sufficient accommodation for the present and prospective workers in the department, and for developing the course of training in those directions in which it seems most advisable.

This all means money; but it is money for a good cause. The cause is the adequate scientific training of men for an industry the highest technical efficiency and progress of which will rely more and more upon the technical qualifications and efficiency of its principal, and therefore most responsible, workers. The recent donations of the South Metropolitan and South Suburban Companies are referred to by Prof. Cobb, who concludes with words which we may adopt: "It is hoped that the gas industry as a whole may "strengthen the firm bond existing between itself and the "University by rendering financial assistance which was "never so badly needed." The time is very opportune. We have the Gas Regulation Act. The industry is reconstructing. Good men will be wanted by it in the future. The training of these men is as important to the industry as the design and efficiency of its plant. Efficient men, plant, and working are the *desiderata* of the industry's future. For the men sufficient training ground of the very best character must be provided.

Gas Engineers as Directors.

A strange story reaches us from Australia, and is detailed in the report of the last meeting of the Metropolitan Gas Company of Melbourne. It seems that, on the occurrence recently of a vacancy on the Board of the Company, a suggestion was made to the Directors by the Metropolitan Gas Company Share Purchase Association that Mr. Philip C. Holmes Hunt (who is well known in this country, and was for some years Engineer of the Metropolitan Gas Company) should be elected to fill the vacancy. The Association disclaimed the idea of endeavouring to obtain special representation on the Board; and Mr. Hunt repudiated the suggestion that he could pay regard to anything else than the welfare of the Company as a whole. The Directors of the Company promised careful consideration for the suggestion. In the result, however, they could not see their way to approve it, for, it is gathered, the two following reasons: (1) It might give offence to the Company's Chief Engineer. (2) That Mr. Hunt, in his capacity as Trustee for the shareholders of the Colonial Gas Association, might be in a delicate position in the event of the Metropolitan Company at any time entering into negotiations for the purchase of the Colonial Gas Association's undertaking. This last

objection almost takes one's breath away, as hardly was the ink dry with which it was penned when the Directors proceeded to fill the vacancy by the appointment of one of Mr. Hunt's colleagues on the Colonial Board!

We are, therefore, concerned only with the first and more serious objection, "It might give offence to the Chief Engineer!" In a circular issued by the three Directors who were retiring by rotation at the last meeting, reference was made to the request of the Share Purchase Association that Mr. Holmes Hunt should be appointed to a seat on the Board; and the following statement among others appeared: "The Directors learned from Mr. Reeson (who "prior to his present appointment was Manager at Beck-"ton—the largest gas-works in England) that the appoint-"ment of his immediate predecessor as a Director would "not only be strongly against his wishes, but that as he felt "such a selection would be regarded among engineers, and "particularly those specializing in gas manufacture, as a "slight upon him professionally, it must mean his resigna-"tion of the office which he has filled for the past seven "years to the great satisfaction of the Board, and to the "advantage of the Company." Now why should the appointment of Mr. Hunt be a ground of offence to the Chief Engineer? There is not the slightest suggestion of any quarrel between him and Mr. Hunt. On the contrary, the two engineers appear to have worked amicably enough throughout the recent gas-workers' strike; and, it is gratifying to say, quite successfully. Why should the appointment as a Director of his "immediate predecessor" be strongly against Mr. Reeson's wishes? He may, for all he knows to the contrary, be in a similar position himself some day; and we do not for a moment suppose he would then like to be turned-down for a similar reason?

We venture to assert, moreover, that Mr. Reeson has entirely misconceived the attitude of his engineering friends at home upon the subject. There may be here and there one who would think with Mr. Reeson; but we are perfectly sure that the vast majority of gas engineers would rejoice at any such advancement of those who have proved themselves worthy of it, and would regard as an advantage their assistance at their respective Boards. As a matter of fact, it is becoming more and more the practice in this country to appoint men who have had practical experience in gas engineering and management to be directors of gas companies; and the liberal-minded engineers of the companies, far from regarding such appointments as a slight upon them professionally, welcome them as being an undoubted advantage not only to the company, but to themselves in presenting their schemes and proposals to the Board. The gas industry being one which is fundamentally technical, it is becoming generally accepted that a gas company should have a member upon its directorate with gas qualifications. That it should be so is only commonsense. And this is the first time we have ever heard of the personal or professional dignity of a chief engineer being assailed by any such appointment. We hope it will be the last. With us it is entirely a matter of policy, and not of person. We should write just the same had the names been other than those of Mr. Reeson and Mr. Hunt, for both of whom we have the highest regard. However, we cannot help feeling that there has been some little erroneous reasoning in this particular matter on the part of Mr. Reeson. Following upon it, the threat of his resignation seems to have proved too much for (shall we say?) the nerves of the business men who form the Board of the Metropolitan Gas Company; and the opportunity was, therefore, lost of securing to the Company the services of a really gas-qualified Director.

In these circumstances, Mr. Hunt, having regard to the principle which was at stake, took, as we think, quite the proper course, of challenging the re-election of the retiring Directors at the succeeding half-yearly meeting. The result was doubtless a foregone conclusion, if only from the fact that the Directors who had to retire happened to be the most influential members of the Board. But we venture to say that, in the hour of his defeat, Mr. Hunt is more highly thought of than ever by his numerous friends. He has done the industry a great service, especially to the professional members of it; and this will not readily be forgotten. A seat on the board of his company is something to which every official gas engineer has a right to aspire; and, with health and strength, his services in this position should be of inestimable advantage to the undertaking, and to all concerned in it—even to the chief gas engineer, whoever he may be, and whatever his qualifications.

Rating and Changes.

Local rates have made considerable flights; and the effects of these have melancholy expression in the accounts of gas companies. A set-off is required; and it is a matter for consideration by all responsible officials of gas undertakings whether, in the changed circumstances, there is not scope for a reduction of their assessments. Gas companies have for several years now been the prey of local authorities in the name of the community; and they have done a good share in keeping the investors of capital in gas undertakings from a fair reward for their money. Not by way of retaliation, but as a matter of justice, it is time that there was an overhauling of the assessments of gas property. Some companies have taken steps in this direction, and have been very successful, for the conditions of things are now such that there is little that can be advanced by way of objection to their claims. It is perfectly obvious that, in this matter, gas companies must look after themselves, seeing that the rating authorities are not likely to approach them voluntarily with an invitation to have their assessments reduced. A contributor, in a short article in a later column, puts the position in a nutshell. He points to established principles in rating, and to the changes in conditions that have taken place since 1914. Applying the principles to the changes, it is shown that there has been a very material reduction in "beneficial occupation," which was established in the Sheffield case in 1863, and which means that the profits of a gas company must be taken into account in the rating of its hereditaments. Following the lines of the reasoning contained in the article, there have been notable successes recently in claims for revaluation, which have represented material savings. There are, of course, considerable differences between the amounts of rates in the pound in different localities; but these do not alone account for some of the wide differences seen in the results of analyses. Such results show some very curious variations. For example in 1914, according to "Field's Analysis," the rates and taxes paid by the South Metropolitan Gas Company equalled 2d. per 1000 c.ft. sold. In 1919, the figure was still 2d. In the case of the Gas Light and Coke Company, the 1919 figure was 3·51d. per 1000 c.ft. sold. If on the 29,786,955,000 c.ft. of gas sold by the Gas Light Company that year, the rates and taxes payable had been 2d. per 1000 c.ft. as in the case of the South Metropolitan Company, the total would have amounted to £248,224, instead of the £446,380 actually paid. In other words, the Company would have paid less by nearly £200,000. If we take the figures for 1920, it is seen that the amount required for rates and taxes in the case of the Gas Light Company was £574,633, which was equal to 4·31d. per 1000 c.ft. sold; and in the case of the South Metropolitan Company, £168,167, which was equal to 2·85d. per 1000 c.ft. sold. Some differences there always will be. In the comparison, the equivalent price per therm would show greater disparity—calorific value per cubic foot having been reduced to (say) 480 B.Th.U., while remaining constant in the case of the other at (say) 550 B.Th.U. In the Gas Light case, volume increased between 1914 and 1919 by 13·9 p.ct., but on thermal content by only (say) 1·2 p.ct., whereas in the other case the thermal and volume increases were alike at 1·5 p.ct. The rating problem is highly important; but has the gas industry grasped its full significance? However, the point of our contributor's article (which only touches the fringe of a complex subject) is that good ground for the revision of valuations exists to-day; and that several gas companies will find it very profitable to investigate their position in this regard.

Carbon Monoxide Evidence.

We would ask Dr. T. M. Legge, the Medical Inspector of Factories, to review the evidence which he gave before the Carbon Monoxide Committee [published last week], and consider it in the light of certain facts. The first is that between 1904 and 1919 the number of the customers of the statutory gas undertakings of the United Kingdom increased from 2,588,917 to 4,510,595. He will at once agree that the latter number means that gas is used in the houses occupied by a very large proportion of the population. The second fact is that between 1904 and 1919, the quantity of gas sold advanced from 97,255,155,000 c.ft. to 145,880,443,000 c.ft. Further, although not all gas undertakings have water-gas plants, during the same period the quantity of water gas distributed has reached the figure of 28,723,808,000 c.ft. Then, in addition, consideration should be given by him to

the evidence already adduced as to the fatalities due to the accidental escape of town gas. Having deliberated over these points, perhaps Dr. Legge will excuse our saying that, in relation to gas affairs as other things, "an ounce of fact "is worth a pound of theory." He did not ask the Committee to attach much importance to the question of chronic carbon monoxide poisoning; he agreed that the figures as to carbon monoxide accidents were remarkably small, having in view the large increase in the use of water gas; and he did not suggest any concordance between the experiences in factories and domestic life. But (according to our reading of his evidence) he did appear to be trying to belittle what gas suppliers are doing in respect of ensuring the safety of gas, irrespective of whether the carbon monoxide content is high or low. He is also a disbeliever in the economy of gas for heating purposes. "Economy" embraces not only money, but labour, convenience, and the reduction of atmospheric conditions that are unhealthy and dirt and labour creating. In such a matter as this, the judgment of a one-point-of-view man cannot have much weight. However, looking at the figures that we have quoted above, the Medical Inspector of Factories will see that there must be very many people who dissociate themselves, and that in a very practical way, from his views.

But Dr. Legge would not or could not say what the percentage of carbon monoxide should be in the gas distributed for town purposes, though he did submit that it should be as low as possible. This is very loose, inconclusive, and uninformative. "As low as possible!" On what basis should this be fixed? He admits that the number of accidents from carbon monoxide is small, which proves that the risk, under the conditions of distribution and use, is more of a phantom than a reality. That therefore cannot be the basis of the "as low as possible" limitation. Nor could he say anything about the economic aspects of gas manufacture. But we do know he would not have the Committee take gas-manufacturing economic considerations as the basis of his "as low as possible." While agreeing that the figures as to accidents are small, he objects to the economic advantage of the gas industry making the best use of its raw materials being placed before the question of risk. This is all very unsatisfactory; and Dr. Legge must forgive us for saying it is also weak and illogical. It stands in curious contrast with the robust evidence of Dr. Leonard Hill and Sir Dugald Clerk. As the Director of Physiology to the Medical Research Council, Dr. Hill has had exceptional opportunities of drawing scientific and practical conclusions in regard to such a matter as this. Giving all due weight to the physiological effects of carbon monoxide on the human system, he deliberately replied negatively to the question as to whether he thought any increase in the amount of carbon monoxide in gas distributed for domestic use would be a serious risk. Dr. Hill's consideration is not bound by potential risks; but he applies the tests of practical experience to his scientific knowledge. And he has found, as so many other competent witnesses have found, and as the Committee have heard, that the danger has been reduced to a low point, and that through a variety of circumstances which must now be well embedded in the minds of the Committee. Again, from the public health point of view he made it perfectly clear that he prefers the abatement of the smoke nuisance to the abatement of the efforts that the gas industry is making to produce a lower-priced gaseous fuel. Sir Dugald Clerk has worked many years with carbon monoxide about him; but he has never suffered in any way as a result. Has Dr. Legge had the same personal experience; has he made the same investigation of the matter as Dr. Hill; has he allowed (as the latter has done) practical experience to take its part in governing, and so modifying, the ideas that might be formed by considering only the theoretical risk? We think not—in fact, his evidence before the Committee makes it perfectly clear that he has not done so.

Information was given by Sir Dugald Clerk as to the aspirations of the gas industry in respect of more economical gas production, and as to the movements of their work in this direction. There was one point upon which he was pressed, and that was as to the limit he would suggest for carbon monoxide, providing the Committee decided to recommend that one should be imposed. The Committee have had quite a good range placed before them. There is the "as low as possible," 10 and 12 p.ct. have been mentioned, Dr. Haldane would go up to 20 p.ct., but Sir Dugald does not want a limit applied at all. He sees no use in applying one. But if one is applied, he urges not only from the standpoint of the economic advantage to the gas industry, but from that of the nation, that the limit should not be less than 30 p.ct. And this on the ground that, unless the industry can go to such a figure, complete gasification can be on any one works only partially practised. Such gas gives a good flame temperature; and it will lead to a large extension of gas consumption in place of solid smoke-producing fuel. While complete gasification will not be universal practice for many a long year, and perhaps never, we must not forget that already several small towns rely upon the gas from such plants, and those plants have saved the situation for some communities. Larger works are using the gas for dilution purposes. The Sheffield Gas Company are about to start an experimental plant of approximately a million cubic feet capacity a day. We are only at the inception of the use of such plants; and their use will extend very largely. Sir Dugald cannot see that there is much difference between the supply of gas containing 20 p.ct. of carbon monoxide and 30 p.ct. But if there is any limitation below 30 p.ct., then those imposing the limitation will, without any sufficient reason, incur the responsibility of preventing the gas industry, as the use of gaseous fuel increases, utilizing in the most economical manner the coal from which gas is made.

There is one point to which we have previously called attention; but a question put to Sir Dugald by Sir W. Pearce causes a return to it. The displacement of coke from the fuel market by the gas-making tendencies of the industry need not disturb anyone. There will be coke and sufficient for many years, and no doubt always. The fear of the industry is that the progress in the demand for gas will have a limitation put upon it by the excessive production of coke. But the utilization of coke for gas production, or the complete gasification of coal, will give gas which can be utilized with a greater thermal efficiency than coke; so that the displacement of coke does not mean that for the portion so disposed of a compensating substitute has to be found. That is quite a mistake. The point was dealt with by example and calculation in connection with water-gas production towards the end of the first editorial in the number of the "Journal" for Feb. 16.

Caution!

Watch all your incoming coal to see that it has not been tampered with for fire-raising purposes.

East Ham and the Gas Light Company's Standard Price.

The East Ham Corporation have not played the game over the new standard price per therm that the Board of Trade have allowed the Gas Light and Coke Company; but, in the result, they have to pay the costs in the litigation that at their instance has taken place. Judging from the array of Counsel appearing before Mr. Justice Darling and Mr. Justice Avory last Tuesday—when the application was heard to make absolute the rule nisi granted to the Corporation calling upon the Board of Trade to show cause why they should not hold a further inquiry into the price proposal of the Company—the costs will be of a sufficient amount to act both as a salutary lesson to East Ham, and a warning to other local authorities to ascertain definitely before they appear in Court with a supposed grievance regarding proceedings under the Gas Regulation Act that they actually have one. The Court discharged the rule. The Corporation had the same facilities to raise objections and to seek any information as all other authorities, and during the same prescribed period. What satisfied other bodies, however, did not satisfy East Ham—not even the full estimate which the Company prepared, and the giving of which, Mr. Justice Darling pointed out, was not a statutory obligation on the Company. The East Ham Council wanted, it seems, still more statistical particulars (their nature is not revealed) to enable them to formulate their representations against an increase in the standard price on the therm basis. This presupposes that if the Corporation could have had additional information, it would have enabled them to support their objection which they apparently had already formed without the extra information which they desired. Their irrational position was too much for the Court. Their Lordships could not see there was any grievance, or any insufficiency of information. Nor could

they accept the inference to be drawn from the action of the Corporation that the Board of Trade officials and their accountants are mere automata, without brains and intelligence.

A Threatened Coal Stoppage.

At the time of going to press, the country is within a comparatively few hours of the consummation of a threatened coal stoppage. The miners do not want it, nor do the coal owners. But both sides are obdurate over the basis of the wages settlement. The representatives of the men want to retain for the miners all that has been gained in the way of pay and hours by the tyrannous exercise of power by the Miners' Federation during and since the war, and which has been largely instrumental in bringing the coal industry to its present unhappy pass. The coal owners on their part desire that the industry shall at once with decontrol be placed on an economic basis. The miners' delegate conference last Thursday decided not to accept the owners' proposal for a settlement on the district basis (which includes a scheme, as described last week, for profit-sharing), but to adhere to the policy of a national settlement. Only Yorkshire, Northumberland, and Durham were favourable to the owners' plan. Every week a loss is being incurred in the industry; and the Miners' Federation are now hoping that their stubbornness will induce the Government to extend the period of control, and continue to subsidize the industry at the taxpayers' expense, in order to give more time to do something which they have been unable to effect between the strike settlement and now. In fact, the Federation think the Government should finance the industry through all the present abnormal period. There will be no end to the "abnormal period" while the existing conditions prevail in respect of costs of production and low output per man. There is nothing therefore to be gained by the miners' suggestion, other than additional hardship for the taxpayers and preferential treatment for the miners. The miners themselves can do more to remove the abnormal conditions than any other body. The Secretary of the Miners' Federation (Mr. Frank Hodges) sees nothing more probable than a complete stoppage of the industry within a few hours, unless the Government intervenes. There is no need for that; the men who desire work can have it. The owners' notices to the men expire with the period of control; and the pits will then be open to workers on the best terms the industry can afford. If, however, there is to be a struggle, the miners, we are afraid, will find that the much diminished wealth of their unions will not keep them afloat very long. When there is work on offer, if refused, there can certainly be no unemployment pay.

Coal Output.

The weekly returns seem to indicate that coal output has now settled-down to the uniform low level caused by fewer persons being employed in the mines and to short time being worked —all of which is the result of the short demand for coal due to trade conditions and the sacrifice of export trade to high producing costs. During the week ending March 12, 4,275,800 tons of coal were raised; this being only about 16,000 tons better than in the preceding week, when the production was 4,259,000 tons. In the week last year corresponding to that of March 12 this year, the production was 4 900,640 tons.

Reactions in Gas Producers.—Dr. J. H. Paterson, the President of the Newcastle Section of the Society of Chemical Industry, recently described the generally accepted views regarding the reactions taking place in gas producers. He pointed out that, if high enough temperatures were attained, the first product of the reaction between air and carbon would be carbon monoxide only —which was not the theory usually held. This fact allowed for using thin fuel-beds, provided fuel consumptions of over 40 lbs. of carbon per square foot of grate area were attained. It was unfortunate that there should be practically no reliable data concerning the rate of reaction between red-hot carbon and steam. Nor was there much known as to the equilibrium of carbon monoxide, hydrogen, and steam mixtures. It was quite definite that the rate of reaction between steam and the incandescent carbon was slower than that between air and incandescent carbon; so that considerable quantities of steam might pass through a thin fuel-bed without alteration, even at the highest temperatures. This meant that the quantity of steam required to produce a given hydrogen content in producer gas varied not only with the temperature of the fuel-bed, but in proportion to the thickness of the bed employed.

ROBERT PORTER: AN APPRECIATION.

By R. G. Shadbolt.

Permit me to supplement your "Obituary" notice in the last issue of the "Journal" by a personal appreciation of one who knew Robert Porter for the latter two-thirds of his life.

Coming of an old Fylde family, he received his early training in gas affairs under the late John Chew, at Blackpool. His first step from Blackpool was to the management of the Kirkham (Lancs.) Gas-Works, where he came under the influence of the late Henry Green, of Preston. Needless to say, both at Blackpool and at Kirkham he served in a hard school, which doubtless had much to do with the moulding and forming of his character generally; but more particularly with his conduct of gas affairs, as exemplified in after-life. In due time, he removed from Kirkham to Holmfirth, and thence to Elland, as you have already intimated. At Elland, he spent exactly the latter half of his life. Consequently, the Elland-cum-Greetland Gas Company and Robert Porter became synonymous terms.

It was, naturally, during the period of his conduct of the Elland gas undertaking that his former experiences crystallized; and his application of the knowledge and principles previously assimilated, went to reveal the thoroughly practical and painstaking character of the man. Inscrutable Providence has removed him from our midst; but his works (at Elland, in particular) will long remain a monument to his foresight and ability as a gas engineer.

Work was the key-note of his whole career, and one can truthfully say, in the words of Addison: "Through winds and waves and storms he worked his way;" for his appetite for work was only equalled by his persistency of purpose. Trouble and difficulty he experienced in full measure; yet he pressed-on.

He had little tolerance for the shifty and thriftless; and any such, finding their way into his employ, were given "short shrift." Let a man show grit and an industrious tendency, and he met with all possible encouragement, and sooner or later a "lift on the way." Many men in responsible positions in the gas industry to-day owe them largely to the "grounding" and "gruelling" received at the hands of Robert Porter.

He was jealous of the status of the gas engineer, and took a keen interest in all organizations connected with the industry; for, to him, the complete gas engineer was a commercial man and accountant, as well as a technician. This interest may not have been so apparent to the younger generation of gas men as to his contemporaries, as the calls upon his time of late years were too numerous to permit of his personal attendance at many of the various assemblies. Nevertheless, nothing of vital interest escaped him; and he was probably as well posted in gas events as any man in the industry.

His occupancy of the presidential chair of the Manchester District Institution of Gas Engineers was to my mind at the time but a forerunner to that of the national organization; but before such an event could be consummated, he found his *métier* among the smaller undeveloped gas undertakings dotted about the country, and sundry budding communities ripening for a gas supply. The calls upon his time and services in these directions, added to an increasing demand for his counsel and advice in other quarters, diverted his footsteps. There are flourishing undertakings to-day that have been rescued from a parlous condition, by his unwearying energy. I know no man more versatile, or better acquainted with the varying conditions under which gas supply is conducted in different parts of Great Britain. He was quick to "size up" a new situation, and seldom wavered from his course, once his mind was made up. Among other things, I believe he was one of the earliest, if not actually the first in this country, to experiment upon a practical scale with the supply of coke-oven gas *viâ* an ordinary gas-works.

As a man, he was many-sided. Stern and unbending when occasion required, he would display a most considerate and kindly nature, when the necessity arose. This latter trait was probably never better exemplified than by the most welcome and untiring services rendered by him in connection with the local hospital, during the war period. Music for him had considerable charm; and his love of flowers amounted almost to a passion. His attachment to home was a marked characteristic; and he never tired of adding a touch here, and another there, "just to improve things"—in all of which he displayed considerable taste. Indeed, it is but a very short time since he last altered and improved his home, so that it might be even more cosy, and "last my time."

His intensity of purpose in everything to which he put his hand, at times became a fault, and that to his own personal detriment, of which we think he was not altogether unaware, for he had ever before him a species of "mirage" which promised rest and relaxation in the near future. Year after year, to the very end, he promised himself that, when this or that was completed, he would "ease off" and "take more leisure." But it was not to be! Strenuous work occupied him practically up to the moment of submitting himself to the operation that was to mean so much. He met it with serenity, as a matter of course, for he had suffered greatly, and for many years! I have at times thought that the variety and number of his activities often kept him going; for, undoubtedly, his strength of mind again and again overcame his physical disabilities.

He worked hard, and could play as well as anyone. No one

more enjoyed a joke or a little congenial company—he made a good friend and companion; but the occasions for rest and recreation became fewer as the years passed by. However, we must bow to the inevitable; for we shall know him no more!

He was an exceptional man, and while he himself would have been the first to disclaim any title to leadership, he was certainly one of those who form the backbone of the profession of gas engineer. Both the world and the industry are the poorer for the passing of Robert Porter.

OBITUARY.

JOHN MILES.

The death took place last Wednesday, at Bourneside, Southgate, at the age of 85 years, of Mr. John Miles, who was widely known in connection with the administration of gas and other large undertakings, and had been a Director of the Gas Light and Coke Company since 1898. At the time of Sir Corbet Woodall's death, Mr. Miles was Deputy-Governor of the Company, to which position he was appointed in 1912; and in May, 1916, he became Governor, from which post he retired (while retaining his directorship) at the end of 1918, when Mr. D. Milne Watson, the then Managing-Director, was elected Governor in his place.

In the year 1873, Mr. Miles was elected a Director of the Brighton Gas Company; and nine years later, as Chairman of the Company, he joined the Board of the Brighton and Hove Gas Company, with whom an amalgamation took place. His election as Chairman of the amalgamated Company occurred in 1903; and six years afterwards he retired from the Board. He became a Director of the Southgate and District Gas Company (at that time the Colney Hatch Gas Company) in 1891, and the Chairman in 1904. Of the Hornsey Gas Company he was elected a Director in 1896, and became Chairman in 1906—retiring from the Board five years later. In 1896, also, he was elected a Director of the Lea Bridge District Gas Company, becoming Chairman in 1900, and retiring from the Board in 1911.

Mr. Miles's numerous other directorships at different times included the West Middlesex Water Company and the New River Company; and he acted as a representative of the former Company on the Board of the Staines Reservoirs. He was a Justice of the Peace for the County of Middlesex.

The death is announced of Mr. J. G. Hancox, of Worcester, who was until recently in the service of a Darlaston firm of manufacturers. He formerly held the position of General Assistant at the Malvern Link Gas-Works. In 1902 he became Assistant Engineer at the Ormskirk Gas-Works, and later held a similar position at the Truro Gas-Works. Subsequently he left the gas industry to devote himself more specifically to mechanical engineering.

PERSONAL.

Mr. T. H. Poulson, whose appointment was announced a fortnight ago, as Engineer and Manager to the Stafford Corporation Gas-Works (in succession to Mr. W. M. Valon, who becomes Technical Director to Messrs. Major and Co., of Hull), is a native of the town. He has been, since 1914, Chief Assistant Engineer and Manager at the gas-works; and is a son of the late Mr. Arthur Poulson, who died in 1914 after holding the post of Superintendent of the works for nearly thirty years. Born in 1886, Mr. Poulson was educated privately and at a secondary school, and while a student at Stafford Municipal Technical School was awarded certificates in machine drawing and design, building construction, chemistry and mathematics, and applied mechanics. He afterwards took a two years' course at Birmingham University, where he carried off the highest certificates in gas manufacture and distribution. He served as a pupil-apprentice at the engineering works of Messrs. W. G. Bagnall, Ltd., and received his early training as a gas engineer at Stafford under Mr. Hubert Pooley. Eleven years ago he became Chief Assistant Engineer and Manager to the Cannock, Hednesford, and District Gas Company; and during the three years he held this post, he designed new works on a site with a capacity of 300 million c.ft. per annum, and also superintended the erection of new purifiers and a 500,000 c.ft. capacity gasholder, including steel tank. In 1913 he accepted the post of Chief Assistant Engineer and Manager of the Nelson Corporation Gas Department, and during his stay there had entire control of the Brierfield and Nelson Works, each of which is practically of the same capacity as the Stafford works. He returned to Stafford about seven years ago as Assistant Engineer and Manager, and since then has had charge, under Mr. Valon, of the entire reconstruction of the gas-works. This included the erection of a new Glover-West vertical retort installation, and a million c.ft. gasholder, with steel tank, besides other important additions to the plant. The greater portion of this work has been carried out by Corporation workmen, under Mr. Poulson's direct supervision. Mr. Poulson is an Associate Member of the Institution of Mechanical Engineers, and of the Institution of Gas Engineers, and was President of the Midland Junior Gas Association during 1918-19.

Mr. H. Turnbull, who has been Assistant Gas Manager at Scunthorpe since January, 1914, has been appointed Manager to the Cleator Moor Urban District Council Gas-Works. Mr. Turnbull served four years in the war, was awarded the Military Medal, and later was mentioned in despatches.

Mr. W. Wilberforce, who has just been appointed Assistant Fittings Superintendent to the Wolverhampton Gas Company, has, since January, 1915 (with the exception of twenty months on military service), held the position of Sales Manager to the Aldershot Gas, Water, and District Lighting Company. Prior to going to Aldershot, he spent about ten years with the East Hull Gas Company.

Mr. Reginald Josiah Sarjent, M.Sc., A.R.C.Sc., Research Chemist with Messrs. Hadfields, Ltd., of Sheffield, and formerly with Messrs. Bolckow, Vaughan, & Co., of Middlesbrough, is recommended by the Bradford Technical Education Committee to be appointed Lecturer in Metallurgy at the Bradford Technical College. Mr. Sarjent graduated with honours in chemistry at the London University, and studied at the Imperial College of Science and Technology from 1913 to 1918; being Research Assistant in the department of Chemical Technology at that institution for two years prior to going to Middlesbrough. He is a specialist on the heat treatment of steel.

EDINBURGH GAS ENGINEERSHIP.

A long discussion took place at the Edinburgh Town Council meeting last Wednesday, on the question of the appointment of a successor to Mr. Alexander Masterton, who retires from the position of Gas Engineer and Manager on June 7. The Gas Committee recommended, by a small majority, that Mr. Harry H. Gracie, the Assistant Engineer and Manager, be appointed.

In moving the recommendation, Mr. James Stewart (the Convener of the Gas Committee), stated that Mr. Gracie had been for thirty years in the service of the Gas Commission, and was fully acquainted with all the work. He had also the necessary technical training. Mr. Harvey, in seconding, said that he attended the Heriot-Watt College at the same time as Mr. Gracie; and he could not forget how prominently his name stood out year after year. The gas undertaking in Edinburgh could not be compared with smaller concerns which, because they were smaller, could take advantage of up-to-date methods of gas production.

It was moved by Mr. Allan that Mr. J. W. Napier, of Alloa, be appointed. Sentiment in a matter of this kind, he said, should not be allowed to rule. Fresh blood was wanted at Granton. Mr. Napier was one of the foremost men in Scotland in the gas world; and he had shown by his balance-sheets that he had the most economical results of any of the applicants. Bailie Robertson seconded, and urged that they wanted cheap gas. The price of gas in Alloa was a little more than one-half the rate charged in Edinburgh. He agreed that this was due largely to vertical retorts; but it showed the foresight of the man who, when these were almost in an experimental stage, stepped in and adopted them, with the result indicated.

Mr. Carmichael proposed Mr. George Keillor, Engineer and Manager of the Greenock Corporation Gas Department, who found a seconder in Bailie Goalen.

After further discussion, in which, among other things, it was suggested that the whole question should be sent back to the Committee for re-consideration, a vote was taken, which resulted as follows: For Mr. Gracie, 36 votes; for Mr. Napier, 20 votes; for Mr. Keillor, 3 votes.

The Council approved the Gas Committee's recommendation that six months' notice be given to Mr. W. R. Herring, terminating his engagement as Consulting Engineer.

Silica Bricks for Coke-Ovens.

On the advice of certain coke-oven firms, the Rheinische Stahlwerke decided to use silica brick linings for both their batteries of coke-ovens; and the experience gained in their use has been fully described by Dr. Enzenauer, on behalf of the Coke-Oven Committee of the German Ironmasters' Committee, in a communication a translation of which has appeared in the pages of the "Iron and Coal Trades Review." After the lapse of four years, except for the floors, which are of ordinary firebrick, the silica linings do not show any special signs of wear. The silica lining is practically insensitive to the action of salty and wet coals. The advantages of silica bricks are a very considerable increase in the quantity of coal treated and in the production of coke and gas; while slagging, fusing, and sagging of the walls through overheating are rare, so that there is no need to fear high cost of repairs and loss of output from these causes. The economic efficiency of the plant is high. Considerable interest has, says the author, been taken of late in silica linings; and a number of batteries have been erected. Basing his opinion on the favourable experience that has been gained in every respect with silica bricks, he thinks himself justified in expressing the opinion that the use of silica linings for coke-ovens will become general. By way of warning, it is pointed out that the fact that silica linings will stand high temperatures without injury, leads to a tendency to run the batteries at a higher temperature than is necessary—a practice which naturally results in a high consumption of gas, hot ovens, decomposition of the gases, and waste of valuable heating agents.

ORDERS ISSUED UNDER THE GAS REGULATION ACT.

ON inquiry at the offices of the Board of Trade last week, we were informed that the Orders under section 1 of the Gas Regulation Act noticed below had been issued; and the Director of Gas Administration (Mr. H. C. Honey) kindly supplied us with copies for the information of "JOURNAL" readers. The major portions of the Orders are in similar terms; and therefore we reproduce *in extenso* the Order of the Gas Light and Coke Company, and indicate in the succeeding paragraphs the variations in the standard or maximum prices of the other undertakings. There was also issued by the Stationery Office last Thursday the draft of a Special Order (which will be found below) made by the Board of Trade under section 10 of the Act, on the application of the Swansea Gas Light Company.

THE GAS LIGHT AND COKE COMPANY (CHARGES) ORDER, 1921, MADE BY THE BOARD OF TRADE ON MARCH 23, UNDER SECTION 1 OF THE GAS REGULATION ACT, 1920 (10 & 11 GEO. 5, C. 28).

Whereas under sub-section (1) of section 1 of the Gas Regulation Act, 1920 (in this Order referred to as the "Act"), the Board of Trade may, on the application of any gas undertakers, by Order, provide for the repeal of any enactments or other provisions requiring the undertakers to supply gas of any particular illuminating or calorific value and for substituting power to charge for thermal units supplied in the form of gas:

And whereas the Gas Light and Coke Company (being undertakers within the meaning of the Act, and in this Order referred to as the "undertakers") have made application to the Board of Trade for an Order under section 1 of the Act:

And whereas the undertakers have, in accordance with the provisions of sub-section (6) of section 1 of the Act, given public notice of their application for an Order:

And whereas by paragraph (*f*) of sub-section (4) of the said section 1 it is enacted that any Order made under that section shall have effect as if enacted in the Act:

And whereas by section 19 of the Act it is enacted that the provisions of any Order made under the Act shall have effect in lieu of any provisions to the same effect, or inconsistent therewith, in any Act or Order having the force of an Act relating to an undertaking with respect to which an Order has been made under the Act:

Now, therefore, the Board of Trade, by virtue of the provisions aforesaid, and in the exercise of their powers under the Act, hereby order as follows:

SHORT TITLE.

1.—This Order shall be cited as the Gas Light and Coke Company (Charges) Order, 1921.

DECLARED CALORIFIC VALUE.

2 (1)—The undertakers shall, within three months from the commencement of this Order, give notice by advertisement in the "London Gazette" of the calorific value of the gas which they intend to supply (in this Order referred to as "the declared calorific value"), and of the date (in this Order called "the declared date") from which they will supply gas of the declared calorific value, which date shall not be more than three months from the date of the notice.

(2) After the declared date, the charges which the undertakers may make in respect of the supply of gas shall be such charges as are hereinafter authorized for thermal units supplied in the form of gas; and any provision in force at the date of this Order of any Act or Order having the force of an Act in relation to the quality of gas supplied by the undertakers shall cease to have effect:

Provided that this sub-section shall have effect as respects the charges to any particular consumer as from the first reading by the undertakers of that consumer's meter after the declared date, and not earlier.

(3) A copy of the notice referred to in sub-section (1) of this section shall be sent to each local authority and to every consumer and to the Board of Trade.

STANDARD PRICE.

3.—After the declared date

(*a*) The standard price in respect of gas supplied by the undertakers shall be fifteen and one-fifth pence per therm.

(*b*) The price of seventeen pence per therm shall be substituted for the price of three shillings and eleven pence per thousand cubic feet mentioned in sub-section (3) of section 34 of the Gas Light and Coke Company's Act, 1909 (9 Edw. 7, c. 87).

MODIFICATION OF SLIDING-SCALE.

4.—Any provision of any Act or Order having the force of an Act by virtue of which the undertakers may increase or reduce the price charged by them above or below a standard price, subject to a reduction or increase in the dividend payable by the undertakers on their ordinary capital, shall have effect as respects any dividend declared by the undertakers after the declared date as if one-fifth of a penny per therm were substituted for each penny per thousand cubic feet of increase or decrease of price, and as if the standard price referred to in such provisions were the standard price prescribed by this Order; and for the purpose of ascertaining the authorized rate of dividend for the half year in which the declared date occurs, the price charged per thousand cubic feet during that part of the half year (if any) before the declared date shall be rendered into the equivalent price per therm by dividing it by four and four-fifths.

CHARGE FOR PREPAYMENT METERS.

5.—Section 4 of the Metropolis Gas (Prepayment Meter) Act, 1900 (63 & 64 Vict., C. 272), shall, in its application to the undertakers, be read as if the words "number of therms" were substituted for the words "quantity of gas," and as if the words "twopence per therm" were substituted for the words "tenpence per one thousand cubic feet."

MEASURE OF THERMS SUPPLIED.

6.—The number of therms supplied to any consumer shall be ascertained by multiplying the number of cubic feet of gas registered by the consumer's meter by the number of British thermal units comprised in the declared calorific value, and dividing the product by one hundred thousand.

VARIATION OF DECLARED CALORIFIC VALUE.

7.—If at any time the undertakers intend to alter the declared calorific value, they shall give notice of their intention to supply, as from a date to be therein specified, and being not less than three months from the date of such notice, gas of such calorific value as may be declared in the notice; and the calorific value so declared shall, as from the date so specified, be the declared calorific value for the purposes of this Order.

The notice required by this section shall comply with the requirements of this Order with regard to the notice in which the calorific value was originally declared.

CONSUMERS' BURNERS.

8.—If, and so often as, the undertakers shall alter the declared calorific value of the gas, they shall at their own expense effect such alteration, adjustment, or replacement of the burners in consumers' appliances as may be necessary to secure that the gas can be burned with safety and efficiency, except in the case of any consumer who objects to such alteration, adjustment, or replacement as aforesaid.

PRESSURE.

9.—If the declared calorific value is less than 350 British thermal units, the minimum permissible pressure at which the gas may be supplied shall be that specified in the Schedule to this Order.

COMMENCEMENT OF ORDER.

10.—This Order shall come into operation on March 24, 1921.

(Signed) H. F. CARLILL,
An Assistant Secretary to the Board of Trade.
Dated this 23rd day of March, 1921.

SCHEDULE.

Where the declared calorific value is below 350 B.Th.U. and not below 300 B.Th.U., the minimum permissible pressure shall be two-and-a-half inches.

Where the declared calorific value is below 300 B.Th.U., the minimum permissible pressure shall be such pressure (not being less than three inches) as shall be prescribed by the Gas Referees.

Ashton Gas Company.

After the declared date, the standard price in respect of gas supplied by the undertakers shall be 16d. per therm.

Croydon Gas Company.

The standard price clause in the Croydon Order fixes the standard price at 17⅛d. per therm; and it is provided that the words "four-fifths of a penny per therm" shall be substituted for the word "fourpence" where it secondly occurs in section 16 of the Croydon Gas Act, 1905.

Frodsham Gas and Water Company.

After the declared date, standard prices of 20d. and 21d. per therm respectively shall be substituted for the standard prices of 4s. 7d. and 5s. per 1000 c.ft. mentioned in section 64 of the Frodsham Gas and Water Act, 1888.

For the purpose of ascertaining the authorized rate of dividend for the year in which the declared date occurs, the price charged per 1000 c.ft. during that part of the year (if any) before the declared date shall be rendered into the equivalent price per therm by dividing it by four and seven-tenths.

Oxford Gas Light and Coke Company.

After the declared date, the standard prices in respect of gas supplied by the undertakers shall be 15¼d. per therm within the City of Oxford and 16⅜d. per therm outside the city.

For the purpose of ascertaining the authorized rate of dividend for the year in which the declared date occurs, the price charged per 1000 c.ft. during that part of the year (if any) before the declared date shall be rendered into the equivalent price per therm by dividing it by four and three-fifths.

Sheffield Gas Company.

As from the declared date—

(*a*) The maximum price in respect of gas supplied by the undertakers shall be 13⅜d. per therm.

(*b*) The price of 12⅜d. per therm shall be substituted for the price

of 3s. 6d. per 1000 c.ft. on which, under the provisions of section 23 of the Sheffield Gas Act, 1917, the rate of dividend payable on the "B" stock of the undertakers is dependent.

(*c*) Prices of 11⅛d., 11¼d., and 10⅜d. per therm respectively shall be substituted for the prices of 3s. 3d., 3s., and 2s. 9d. per 1000 c.ft. on which, under the provisions of section 23, the rate of dividend payable on the "C" stock of the undertakers is dependent.

(*d*) The price of 12⅜d. per therm shall be substituted for the price of 3s. 6d. per 1000 c.ft. on which, under the provisions of section 7 of the Sheffield Gas Order, 1890, as confirmed by the Gas Orders Confirmation (No. 1) Act, 1890, the remuneration payable to the Directors of the undertakers is dependent.

Watford Gas and Coke Company.

After the declared date, the standard price in respect of gas supplied by the undertakers shall be 17⅝d. per therm.

For the purpose of ascertaining the authorized rate of dividend for the half year in which the declared date occurs, the price charged per 1000 c.ft. during that part of the half year (if any) before the declared date shall be rendered into the equivalent price per therm by dividing it by four-and-a-half.

Welwyn, Knebworth, and District Gas Company, Ltd.

As from the declared date, the maximum price in respect of gas supplied by the undertakers shall be 18d. per therm.

Charges for Prepayment Meters.

(1) The undertakers may demand in respect of gas supplied through a prepayment meter a not greater charge than in respect of gas supplied to private consumers within their limits of supply through any other kind of meter or by any other method of supply.

(2) (*a*) The charge for the hire of any prepayment meter and fittings to be used therewith shall be a sum of money calculated according to the number of therms supplied and the maximum rate of charge shall be:

For a prepayment meter and fittings (including a cooking stove) 3d. per therm;

For a prepayment meter and fittings (not including a cooking-stove) 2⅜d. per therm.

(*b*) The charge for the hire of a prepayment meter without fittings shall be either a sum of money calculated according to the number of therms supplied (when the maximum rate of charge shall be 1⅜d. per therm), or at the rate of 10 p.ct. per annum on the cost of the meter, whichever shall be the higher.

(*c*) The said charges shall include the providing, letting, fixing, repairing, and maintenance of the meter and fittings or of the meter (as the case may be), and the cost of collection and other costs incurred by the undertakers in connection therewith.

(3) For the purpose of this section the expression "prepayment meter" means any meter or appliance by which the quantity of gas supplied is regulated according to the amount of money prepaid therefor.

Wrexham Gas Company.

As from the declared date the maximum prices in respect of gas supplied by the undertakers shall be 17⅛d. per therm within a radius of a mile from the centre of the doorstep of the north porch of the Church of St. Giles or parish church of Wrexham; 19d. per therm within a radius of two miles from the same point; and 20⅛d. per therm beyond the said radius of two miles.

SWANSEA GAS ORDER, 1920.

Draft of a Special Order made by the Board of Trade under Section 10 of the Gas Regulation Act, 1920, on the Application of the Swansea Gas Light Company.

Short Title.

1.—This Order may be cited as the Swansea Gas Order, 1920.

Application of Certain Provisions of the Companies Clauses Act.

2.—The provisions of the Companies Clauses Consolidation Act, 1845, and Parts I., II., and III. of the Companies Clauses Act, 1863, as amended by subsequent Acts, so far as the same are respectively applicable, and except so far as may be varied by, or inconsistent with, the provisions of this Order, are hereby incorporated with this Order; and this Order shall have effect as if it were a Special Act within the meaning of those Acts.

Interpretation.

3.—In this Order the expressions "stock" and "stockholder" include shares and shareholders. The expression "Company" means the Swansea Gas Light Company.

Power to Raise Additional Loan Capital.

4.—(1) The Company may, notwithstanding anything contained in any Act or Order relating to the Company, raise on mortgage, or by the creation and issue subject to the provisions of this Order of redeemable or irredeemable debentures, debenture stock, or bonds, or partly in one mode and partly in another, as may be determined from time to time by resolution of the Company passed at a special meeting of the Company convened for the purpose, such an amount as shall be sufficient to produce, after taking into account premiums or discount (if any) which may be obtained or allowed respectively on the issue thereof, and after deducting therefrom the expenses of, and incident to, such issue, the sum of one hundred and ninety-nine thousand four hundred pounds.

(2) The provisions contained in the schedule to this Order shall apply in respect of redeemable debenture stock issued in pursuance of this Order.

Priority of Mortgages and Debenture Stock over Other Debts.

5.—All money to be raised on mortgage or bond or debenture stock under this Order shall have priority against the Company and the property from time to time of the Company over all other claims on account of any debts incurred or engagements entered into by them after the commencement of this Order: Provided always that this priority shall not affect any claim against the Company or their property in respect of any rent charge granted or to be granted by them in pursuance of the Lands Clauses Acts, or in respect of any rent or sum reserved by, or payable under, any lease granted or made to the Company which is entitled to rank in priority to or *pari passu* with the interest on their mortgages or debenture stock.

Application of Money.

6.—All moneys raised under this Order, including premiums (if any), shall be applied to the purposes of the undertaking of the Company to which capital is properly applicable.

Costs of Order.

7.—All costs, charges, and expenses of, and incidental to, the applying for preparing and obtaining this Order, and otherwise in relation thereto, shall be paid by the Company.

Schedule.

Provisions Relating to Redeemable Debenture Stock.

1.—The Company may create and issue any debenture stock which they are authorized by this Order to create and issue, so as to be redeemable on such terms and conditions as may be specified in a resolution of the Company passed at a special meeting convened for the purpose.

2.—If it is so provided in the resolution, the Company may—

(*a*) Call in and pay off the stock or any part thereof at one hundred pounds for every one hundred pounds stock at any time before the date fixed for redemption.

(*b*) Redeem the stock or any part thereof either by paying off the stock or by issuing to any stockholder, subject to his consent, other stock in substitution therefor, and may, for the purpose of providing money for paying off the stock or providing substituted stock, create and issue new stock (redeemable or irredeemable) or re-issue stock originally created and issued as aforesaid; so however that the creation and issue for that purpose of any particular class of stock does not make the total nominal amount of such stock exceed the amount of that class of stock which the Company are for the time being authorized to create, except during the necessary interval between the creation and issue of the new stock and the redemption of the old stock.

3.—Save as hereinafter provided, the Company shall not redeem out of revenue any debenture stock so created and issued as aforesaid; but the Company may, if they think fit, at any time during a period of ten years from the creation and issue of any such debenture stock, redeem out of revenue to an amount to be approved by the Board of Trade any such stock created and issued for the purpose of defraying abnormal reparation expenditure due to circumstances arising out of the present war, and such redemption may be effected either by way of the repayment by annual instalments of the said sum or by way of a sinking fund calculated to pay off the same at the expiration of the period aforesaid.

Evening Star Lodge, No. 1719.

The Annual Meeting of the Lodge was held at the Freemason's Hall, London, on Wednesday last, when W. Bro. Charles Clare was installed in the chair in succession to W. Bro. A. C. Beal. Subsequently the following officers were duly appointed for the coming year:

S. W. . . .	W. Bro. Frank Jervis.
J. W. . . .	Bro. Frank West.
Chaplain . .	W. Bro. F. W. Cross, P.M., L.R.
Treasurer . .	W. Bro. Walter T. Dunn, P.M., L.R.
Secretary . .	W. Bro. Arthur Valon, P.M., L.R.
Dir. of Cer. .	W. Bro. H. W. Packham, P.M.
S. D. . . .	Bro. Rae P. Normand.
J. D. . . .	Bro. G. D. Bidwell.
Organist. . .	W. Bro. J. Fred. Wicks. P.M.
I. G. . . .	Bros. Francis E. S. Clayton.
Stewards . .	W. Bro. Reginald W. Foster, LR. Bro. H. L. Sheppard.

The next meeting of the lodge will be on Monday, May 23, and will coincide with the meeting of the Institution of Gas Engineers. As in former years, the lodge will welcome on this occasion any Mason who is a member of the Institution; and those desirous of attending are requested to communicate with the Senior Deacon [21, John Street, Adelphi, W.C. 2], who will forward the necessary card of admission. Anyone not having previously attended the lodge should forward the names of two brethren who will vouch for him as a Mason. This notice will take the place of the circular-letter it has been usual to send to all members of the Institution.

ELECTRICITY SUPPLY MEMORANDA.

The inquiries that have been, and are being, held into joint authority schemes of generation are having a wonderful effect in clearing vision. It is a good thing. The difficulties of amalgamating municipal forces, the financial disabilities, the troubles as to deficits and rates, and the large disinclination to take part in any combined plan, have resulted in a veering round of view. Local authorities have, through the inquiries, shown conclusively that they are constitutionally and politically quite unfit to take part in co-operative ventures of the kind. If this feeling continues to extend and deepen, it might yet happen that the electric power companies will come out of the present investigation and controversy as top dogs. The municipalities have been given their opportunity. They are throwing it away, because some of them prefer that each present electricity district shall be permitted to develop as best it can without the introduction of a new element. As there will be no disposition to allow things to remain as they are, should it be decided that the present schemes are deficient through insufficient adhesion, then something new will be sought to take the place of the present joint plans. And what better than the work of generation being handed over to the power companies to develop as the extra demands for electric energy claim more producing capacity, and as existing plant falls out of the ranks in an obsolete state?

The Changing Outlook.

This phase of the great electric generation question was partly brought out in the Mersey and North Wales inquiry. It will emerge more forcibly in the consideration of the West Riding (Aire and Calder) district scheme, because, according to a report drawn up by a conference of local authorities, they propose to swallow the Yorkshire Power Company, and that Company are not inclined to be so disposed of, and have refused to discuss the question of sale with an amorphous body such as the authorities who have made themselves responsible for the Aire and Calder scheme. The Yorkshire Company have views of their own; and these views are commending themselves to those who are sick of the inglorious medley which each inquiry in succession reveals. They submit that a joint authority in their area is quite unnecessary, and that substantially all that is required of a joint authority is being done by them without any question of difficult financing, and without any power to pledge or to fall back on overburdened ratepayers. In the Company's area, there are 62 electricity undertakings; and with no less than 40 of these the Company have agreements. Five have not yet begun to supply electricity, so there are only about fifteen who are without business relations with the Company. Thus the Company have already completed the greater part of the work which a joint authority would be called upon to do. Small wonder, then, that the local authorities who are proposing a joint scheme find the acquisition of the Company's undertaking an indispensable part of their programme. As to finance, the Company are of the opinion that, under a joint authority scheme, new taxation would be needed in order to finance the big venture. On the other hand, the Power Company can command capital. The "Electrical Review"— speaking generally, and not of any particular project—recently said that financiers have very little confidence in the somewhat uncertain future of municipal schemes; still less in the shadowy projects that are being proposed by the joint electricity authorities. We have said much the same thing; and to-day investors are looking for higher interest from their money than local authorities are disposed to give. In our opinion, this electricity generating work would be done much better by a privately capitalized concern, under responsible direction, than by a composite body the elements of which are drawn from local authorities who will be always on the look-out for their own individual interests more than keeping in mind those of the general body. Members of local authorities are appointed for the specific purpose of looking after the interests of their own constituents, and in any circumstances these will come first. In the case of a company run on privately subscribed capital, the general financial outcome of the working, through sound enterprise and the creation of conditions which will attract custom, is what the directors have to look after. The shareholders want, and are entitled to, a fair dividend on their capital; and the company have no rates upon which to fall back if they conduct their business in a manner which will not meet their obligations. If the ratepayers only knew of the responsibility that the joint authorities are proposing to impose upon them in connection with these schemes, then we believe there would be a general agitation to hand over the work to those who are prepared to undertake it as a private venture.

Privately Subscribed Capital and No Rate Aid.

Another point for consideration is that the electricity supply industry, as other industries, is likely to be subject to more intense fluctuations in future than before the war; and this is another reason why large schemes of electricity generation and transmission should be handled by private enterprise, and not be left to the management of a hybrid authority, the components of which are drawn from many different local bodies. The hybrid authority means additional machinery imposed on the electricity industry; and this extra machinery is not going to be a cheap thing. The Birmingham Corporation Electricity Department affords an illustration of the considerable fluctuations to which electricity enterprise in industrial areas is now exposed. From April 1 to Dec. 31, the Department made a profit of £39,500. Of this sum, £32,500 was realized during the December quarter, when local trade was fairly active. The six spring and summer months were only favoured with a small and broken load, and realized £7000 of profit. Since the beginning of this year, there has been a great falling-off in the consumption of electricity—due, of course, to trade depression. The Committee, therefore, came to the conclusion that it would be unwise to make any contribution to the relief of the rates. In 1914, £21,000 was handed over, and the price per unit was then 3d. To-day the price is 6½d.; and the Committee are not giving anything in relief of the rates. The 1914 conditions have gone; new conditions have come. There is ample ground provided by these facts for serious reflection, before the local authority embark on joint schemes and shoulder new financial obligations in regard to which theirs will be only one voice among many, and their views may not be in sympathy with those of the majority.

Fluctuations under New Conditions.

If Joint Boards for electricity generation, why not for distribution? That is a question which Mr. W. Fennell has been asking in an article published in the electrical papers. If something is not done, we can quite see that existing distributors will look well after the electrically fat parts of their areas, and make no attempt to go outside into the electrically lean ones. This is only natural; but it is not what the political dreamers of 1919 were talking about, when Mr. Hodge (so it was pictured) would be lighting his cottage, cooking his meals, and warming his toes by the agency of electricity, and at the same time be partly if not entirely thrown out of employment by his work being done for him by electrically operated machinery. Mr. Fennell's argument in favour of joint distribution boards cannot be followed throughout; but we gather from the "Electrical Times" that it is somewhat as follows: The inquiries so far held have disclosed defects and omissions in the 1919 Act. It is obvious that, if matters were left at the trunk main stage, and the authorities waited for bulk consumers, financial disaster would overtake them. Further, farmers and villagers along the trunk mains would be sending applications for supply, quite oblivious of the fact that 35,000 or 60,000 volt mains are not tapable, in the properly understood sense of the word. The need for an organization to deal with supply in detail is thus an absolutely essential accessory to the generation and transmission of electricity over large areas. Simple as this may seem, the promoters of the 1919 Act, and indeed the Commissioners themselves, appear to have practically overlooked the matter of providing any workable machinery for dealing with it. Under section 12 of the Act, a joint electricity authority may not, without special sanction, compete with authorized distributors in their areas; but the Commissioners may, under the same section, sub-section 3, impose upon the joint authority an obligation to supply electricity in unoccupied areas in such circumstances and conditions as may be thought fit. This would, Mr. Fennell says, bring about a difficult situation. Existing undertakers would be dealing with the larger towns and the best-paying urban areas, while the rural districts surrounding them and smaller towns would be in the hands of the joint authority. The kind of organization necessary for such detailed supply in patches over an enormous area is, at the best, difficult to imagine. The arrangement would almost certainly fail to give any sort of satisfaction to consumers, or profit to the joint authority.

Joint Distributing Boards.

A proposal which was discussed at informal meetings of the supporters of the Chester Corporation's scheme is the formation of a joint distributing board for each area. This board would be composed of: (1) The existing undertakers, (2) any local authorities willing to obtain Orders for their areas, (3) rural and other authorities willing to lend their support. The board would itself purchase in bulk for the whole area, thus getting better terms than individuals could do by reason of diversity factor, or by increased quantity on one account. The existing staffs of the authorized undertakers could be taken over by the board, and extended so as to deal with the operation of the distributing undertaking, and the whole district would be adequately dealt with. The formation of a joint distributing board is, Mr. Fennell holds, as logical as the setting-up of a joint electricity generating authority. There are, however, difficulties of a parliamentary nature. The 1919 Act contains no provision for the setting-up of such boards. The nearest approach is a combination of section 12 (3), which enables the Commissioners to impose on a joint electricity authority the duties of distribution, with section 6, which enables the joint authority to delegate any of its powers and duties to committees of the authority. The Commissioners, to whom the idea of a joint distributing board was apparently new, were not certain that section 6 (2) would meet the case; but Mr. Fennell thinks its combination with section 12 (3) might enable it to be done. However, it is always difficult to adapt an Act of Parliament to serve a purpose not contemplated when the Act was passed; and as there is another Bill now before Parliament, it

A Suggestion and Statutory Difficulties.

would be a simple matter to insert a clause which would enable the Commissioners to authorize the formation of such distribution boards, making certain sections of the 1919 Act applicable.

Extensions for Nothing. The other week [see "Memoranda" for March 16] a paragraph appeared with this side heading. It showed how at Hastings it was proposed to carry out certain extensions to the electricity works at a cost of £51,429; and it was mentioned that the Electrical Engineer (Mr. Russell F. Ferguson) estimated that the new plant would save some £5000 per annum on fuel alone, which saving would pay the capital charges on the new expenditure. A report on the extensions has been passed by the Town Council, and approval has been given to the work being carried out. In the report we have an explanation as to how the £5000 is going to be saved. It is to be done in a very simple way. To put it briefly, it is by taking the present extraordinary and economically fictitious price of coal, 56s. 6d. per ton, and deducting from it two savings—first, the difference between that price and the price that will be paid by purchasing 2124 tons of low-grade fuel at 43s. (1300 tons will still be purchased at 56s. 6d.); and, secondly, by the saving effected by using with the new plant 4·3 lbs. of coal instead of 6 lbs. per KW. generated as with the old plant. This 6 lbs. is far from being model working, as the Electrical Engineer will admit; but the high figure, of course, is due to the present inefficient plant. Nor is the 4·3 lbs. of fuel a particularly virtuous figure, seeing that some engineers are generating on an expenditure of 2·5 lbs. of coal (or 26,250 B.Th.U.). So we see that the so-called "saving" is effected by comparing with the present extraordinary high price of coal and the existing bad fuel duty. Under such conditions, anyone can show that extensions can be obtained for nothing, or rather by the savings covering the capital charges. But supposing Mr. Ferguson had been purchasing his coal as he is now going to do at an average price of 48s. 5d. per ton, and supposing his existing fuel expenditure had been at a more reasonable figure (say 4·3 lbs.), what about the savings then? And the difference between the first costs of high and low grade fuels is not all saving. Low-grade fuel means less evaporative duty, and often more labour in ash and clinker removal.

SIXTY YEARS AGO.

[From the "Journal" for March, 1861.]

A Senseless Agitation.—The active promoters of the senseless agitation against the Metropolis Gas Companies are experiencing the fate which sooner or later befals most agitators. The reaction of public feeling daily increases, and threatens to sweep them off the stage whereon they figured, and to consign them to the obscurity of private life. The Honorary Secretary and the Honorary Engineer of the managers of the movement worked hard and skilfully to support the agitation, and, as zealous and able servants, deserved their reward. But such is the ingratitude of mankind that, instead of reward, they are threatened with disgrace and punishment. The proposition of a Hughes and Beal testimonial, that was brought forward by some of their friends, has vanished into thin air—even empty votes of thanks could be with difficulty extracted from two or three vestries; and, instead of uniting in those tributes of respect and gratitude, there is a combined movement by many of the local authorities to reduce the charge for expenses incurred by Messrs. Hughes and Beal to the minimum amount which the conscience of the taxing officer of the House of Commons will permit. This operation is to be performed on Saturday next; and, in the meantime, Mr. Beal—sick at heart with such displays of ingratitude, and indignant at the dismissal of his colleague from his recent appointment—has tendered his resignation as member of his vestry, and retires into private life. It may be said of him in his public career that "nothing so well became him as the leaving it;" and we hope he may be able to steel his mind so strongly against the unkind cuts of his *quondam* friends that they will not disturb his tranquil repose in retirement. Mr. Hughes, fortunately for himself, is not so thin-skinned as his coadjutor. He can look with philosophic eye upon the bursting storm, and as its waves break against him, he can calmly examine the shore to find anything that they have deposited worth picking-up. Like the stormy petrel, he delights to fish in troubled waters; but, more potent than that bird of ill-omen, he helps to raise the storm by which he lives. His keen perception enables him to scent the gale afar off, and thither he hastens to increase its fury, and then to offer himself as the pilot to weather the storm.

A New Thermostat.—It is reported that a new thermostat, which can be set for temperatures up to 400° Fahr., has recently been put upon the market for controlling ovens and other heating appliances. A capsule filled with a volatile fluid is made to switch-off a part of the heating element as soon as the full temperature is reached. Afterwards the full current is switched on and off intermittently, so that a very steady temperature is maintained in the oven or other device controlled. The exact temperature to be maintained can be adjusted to a nicety by altering the position of a weight on a lever which projects outside the oven. Contact is made outside the oven, so as to guard against an explosion or ignition, should the articles being dried give-off an inflammable gas.

THE RATING OF A GAS COMPANY'S PROPERTY.

[Communicated.]

The financial difficulties through which gas companies are now passing lend particular interest to the subject of rating. Amounts paid in rates and dividends have altered in inverse ratio; but those who have strained every nerve to depress gas dividends by insisting on the supply of gas, in effect, below cost price, may be shy in coming forward and saying: "Gentlemen, your rating assessments are too high, we propose to reduce them." Therefore consideration of the important changes which have come about since (say) 1914, and their effect on rating, will be time profitably spent by those who have the welfare of gas companies at heart.

As is well known, the Sheffield case established "beneficial occupation" in the year 1863—in other words, that the profits of a gas company must be taken into account in the rating of its hereditaments. It is also common knowledge that the terms "gross estimated rental" and "net annual value" are defined respectively in section 15 of the Union Assessment Committee Act, 1862, and section 1 of the Parochial Assessments Act, 1836—the gross estimated rental being "the rent at which the hereditament might reasonably be expected to let from year to year free of all tenant's rates and taxes and tithe commutation rent charge if any;" while the net annual value (rateable value) was the same with the addition of the following—"and deducting therefrom the probable average annual cost of the repairs, insurance, and other expenses, if any, necessary to maintain them [the hereditaments] in a state to command such rent."

Thus, to arrive at the gross estimated rental, it is necessary to allow deductions in respect of the tenant's capital as well as in rates paid to local authorities; and from the resultant figure to deduct the cost of repairs, insurance, and a sinking fund based on the replacement values of the various capital parts.

It is at this point that we may well reflect on the changes that have taken place during and subsequent to the war period, and the comparative bearing which they have on the whole result—*e.g.*, (1) the adverse effect of the sliding-scale on distributable profits; (2) greater contributions to higher local public expenditure; (3) the larger capital resources which a tenant must now command; and (4) the replacement values on which the sinking fund must now be based. And *à propos* of the debatable point of assessing profits made but not divided, or conversely divided but not made in the basic period, to consider the conditions attached to Orders made under the provisions of the Statutory Undertakings (Temporary Increase of Charges) Act, 1918.

Very material reduction in "beneficial occupation" is obvious—viz.: (1) The reduction of profit, in some cases from very much above standard dividend to 25 p.ct. below it; (2) the conversion of rateable value *plus* rates to rateable value less rates on the accepted principle that having only so much to assess the higher the rate in the pound the lower the assessment; (3) that the tenants allowance is based on (*a*) the present value of his capital necessary, but not forming part of the hereditaments, (*b*) his greater cash to finance the larger turnover, (*c*) the higher value of all necessary stocks of materials, (*d*) the increased rate of interest on his larger capital; and (4) the more costly repair work, enhanced replacement values, and heavier insurance, making greater disparity between gross and net values.

To argue that increase in the value of the tenant's property is discounted by the increase in the capital value of the premises is fallacious, and would simply mean deprivation of value in some townships for the benefit of others, and all-round injustice—in fact, to argue (and that absurdly) that the whole is greater than its parts.

Depression of gas dividends is depression of gas rateable value—simply cause and effect; and local public expenditure being now in the region of 20s. for each pound of rateable value, it follows that the loss in rates must at least be equivalent to the loss in divisible profit—in other words, what local authorities gained on the swings of dividends is now lost to them on the roundabouts of rates.

Chartered Civil Engineers.

The movement to define more clearly what is implied by the term "civil engineer," in which the Institution of Civil Engineers has been engaged for some time past (says the "Engineer" newspaper), has now entered a new phase. It will be recalled that it was found impossible to effect this object by means of a Private Bill; and the alternative of promoting a Public Bill has also been rejected by the Council of the Institution. In a notice to members which has just been issued, it is announced that steps are to be taken to apply to the Privy Council for the grant of a supplementary Royal Charter, to confer the use of the professional description "Chartered Civil Engineer." The opinion is expressed that the interests of the members will be served by their position being designated in the way suggested, which, if adopted, will soon become recognized as the mark of professional civil engineering status.

Owing to structural alterations at No. 46, Queen Victoria Street, the offices of the Society of British Gas Industries, were last week removed to No. 6, Bond Court, Walbrook, E.C. 4. The telephone number and telegraphic address remain unaltered.

DOMESTIC FUEL CONSUMPTION.

REVIEW.

DURING the past year the author has delivered a series of public lectures on fuel economy in relation to hygiene, at the invitation of the Chadwick Trust; and similar series have been delivered at University College. The whole were reported verbatim in the technical press, also published in pamphlet form by the "Builder." In view of the large demand for the reprints, an attempt has been made to arrange and edit the subject-matter of the lectures, in the form of a summarized connected account of the principal facts relating to the use of heat for domestic purposes, so far as they can be briefly and not too technically explained.* The object will have been attained if the result is a useful contribution to the economizing of our national fuel resources.

The work comprises fourteen short chapters (some only 5 pp. in length) under such headings as: The importance of fuel economy. What is heat? Fuel and heat quantities. Efficiency. Heat requirements of human beings. Hygiene and comfort in connection with heating. Convection and radiation. Heat required in a room. Distribution of heat from an open fire. Practicable reductions of fuel consumption. Low efficiency of cooking operations. Some causes of extravagance. Possible future developments. This is sufficient to indicate the scope of the book, which has been carefully edited to suit an easy conversational style that conveys much information in a readily understandable manner. Among other heating agents, town gas receives a fair and impartial place; and a feature throughout the work is the avoidance of bias in favour of any special article. The treatment of gas as in daily use is superior to anything that we have met with outside the industry; and not only the special references to it, but the whole subject-matter of the book, may be read with advantage by all who are interested in the sales department of a gas undertaking. Even the best experience will find some novel suggestion that can be turned to useful account—especially among the remarks on the utilization of existing appliances to the best advantage, the heating value of ordinary gas-lighting appliances, and the advantages possessed by gas heaters of the footstool type. The book supplies that general knowledge of the claims and drawbacks incidental to competing systems that is indispensable to the efficient salesman. We also recommend the work to the favourable consideration of any intelligent consumer desirous of economizing gas without unreasonable expenditure in time or cash.

Enterprising gas undertakings might well direct attention to some of the reprints above referred to, as the price of the book tells against anything like general distribution.

The first chapter comprises introductory remarks, economic questions, and absence of incentives to economy. Strange to say, a prominent place is given to the hire of cooking appliances in connection with the last-named subject. After mentioning the absence of demand for economical heating or cooking plant on the part of prospective tenants, and consequently the lack of interest in the subject among builders and owners, the author proceeds to lament the tendency (grown up in recent years) towards the hiring-out of cooking appliances by large companies at a cheap rate, frequently at less than cost, profit being looked for in the direction of increased sales. Here we expect some references to gas-fires, but they have escaped observation. And we also fail to see the connection between the size of the hiring undertaking, and fuel economy; while the "cheap rate" is an assistance to that end, rather than an obstacle. We proceed to read that any large company will have scores of thousands of pounds so invested; and if a radical fuel economizing improvement came along, the companies would not take kindly to the innovation, in view of the reduced sales and the virtual scrapping of the plant now on hire. Thus the interests of the large companies militate against the development of natural improvement, and the incentive to economy is absent because it is directly contrary to their commercial interests.

We contend that the author is completely astray in dealing with this matter. The hiring system has been available for half-a-century, and during that time has proved a powerful incentive to fuel economy, under the enterprise of makers, and the encouragement of all enterprising undertakings, which have long since decided that the way to success does not lie in the direction of forcing the use of old-fashioned and extravagant appliances. The possibility of hiring the latest improved makes has led to the "scrapping" of less efficient apparatus, that otherwise would have been worked till it fell to pieces. For one consumer open to purchase, there are a hundred who prefer to hire, and in the absence of facilities in this direction, would retain in use existing old-fashioned articles.

A new invention of such transcendent character as to ensure the immediate scrapping of existing appliances is a remote possibility; but, if it materialized, progress would be hindered by the absence of hiring, because the first to adopt it would be those who are in the fortunate position of being able to call on the large company to remove the appliances on hire at the end of three months. They would take precedence of others who either owned their stoves or were provided with their requirements of this nature by the landlord. The hirers cannot force retention of existing appliances; and whether kindly disposed or otherwise, they would have to make the best of them.

A visit to any gas office or show rooms will elicit the fact that, whether on sale or hire, the object is to place the best, most economical, and otherwise most satisfactory appliances; experience having proved that increased economy does not diminish sales, but increases them. Has the incandescent burner reduced the use of gas for lighting, or have the numerous improvements in heating and cooking appliances (evolved in the testing laboratory which is a prominent feature with all the leading makers) prejudiced their use for these purposes? The gas companies have consistently encouraged economy and efficiency, by means of demonstrations, exhibitions, and advertising literature—to the great assistance of the cause that the author has in hand.

The reasons why large companies are encouraging sales in preference to hire, are obvious to all having knowledge of current financial conditions, and the difficulties of raising additional capital. The author is quite wrong in supposing that apprehensions as to the apparatus being rejected before it is worn out, are in any way concerned.

The public are not educated to the point of taking-up fuel economy as a national duty, in the same spirit that actuated the production of benzole in gas-works; nor are they likely to follow questions of efficiency back to the fountain-head. Large users can conveniently arrange to adopt mechanical stoking and flue-gas analysis; but the small householder is in a different position. Against the savings in fuel there are contra expenses—in the latter case frequently sufficient to convert apparent gain into actual loss. The author recognizes this position to some extent; but there is also the question of time. Who studies economy of gas in connection with an early breakfast or a quick hot bath? And there is an ingrained opposition to household economy in the average Briton, as being related to niggardliness.

The method of reading a meter index and computing the consumption of gas is clearly explained, together with the use of the test-dial as a means of ascertaining the hourly consumption and the cost of the gas consumed by any particular appliance. The B.Th.U. and the cubic foot are also dealt with. But apart from a passing footnote, there is no reference to the "therm," and an excellent opportunity of familiarizing the non-technical mind with the new system of charge is lost. Instructions are included for comparisons between the costs of various heating agents; and that of coal and gas for cooking is on a basis of continuous operation. Obviously, this is the only available course; but it is not fair to gas, as the bulk of household cooking is intermittent—a fact that in many instances makes gas the cheaper.

On p. 28, will be found the inference that in a geyser 15,000 c.ft. of gas will go as far, in providing hot water, as 20,000 c.ft. under an "ordinary gas boiler." The geyser is quick and convenient, but is well known to be far from the most economical method of applying gas for heating water. On the matter of cost, there is nothing to beat the old-fashioned and now obsolete arrangement comprising a bath of thin sheet iron and a boiling ring beneath; and some of the enclosed gas-boilers in use attain a high degree of efficiency.

Among other fuels, the author deals with the use of gas coke, either alone or in conjunction with coal; but he seems to have been unfortunate in regard to his samples. He talks of coke containing 20 p.ct. of water and 25 p.ct. of ash. This is an exceptionally extreme case, and not a fair average of the article as delivered from the gas-works. In many cases, the demand for household purposes has reached dimensions that could neither be developed nor maintained on 45 p.ct. of worse than useless incombustible matter.

In connection with probable future improvements, Mr. Barker fully realizes the possibilities of gas, and gives it a high place. And we might suggest that he should visit the works of one of our leading makers of gas appliances, and see the immense amount of work that has already been accomplished, in the direction of that increased efficiency which he so strongly recommends.

* "Domestic Fuel Consumption," by A. W. Barker, Consulting Engineer and Lecturer on Heating and Ventilating Engineering, University of London. London: Constable and Co.; 1920. [Price, 14s.]

Next Annual Conference of the "B.C.G.A."—The Executive have ascertained that a proposal to hold the British Commercial Gas Association's next annual meeting and conference at Glasgow would meet with the approval of the Lord Provost and Corporation of the city, and recommend that they be authorized to arrange for a meeting to be held there in the latter half of September.

North British Association of Gas Managers.—The Association will hold a spring meeting in the Lesser Town Hall, Johnstone, on Friday, April 8; and the proceedings will open with luncheon at 12.30, on the invitation of the Provost, Magistrates, and Councillors of the burgh. The subsequent business meeting will be presided over by Mr. James Dickson, of Johnstone, who will deliver an address on the gas undertaking of which he has charge. This will be followed by papers by Mr. George Braidwood, of Coatbridge, on "The Therm: Notes and Comments;" and by Mr. Henry Rule, of Kelty, on "Working Results in a Tully Plant." After the meeting, the members will visit the engineering works of Messrs. John Lang & Sons. This is the first spring meeting to be held under the ægis of the North British Association; and it is hoped that the members will turn out in force, and make the gathering a real success.

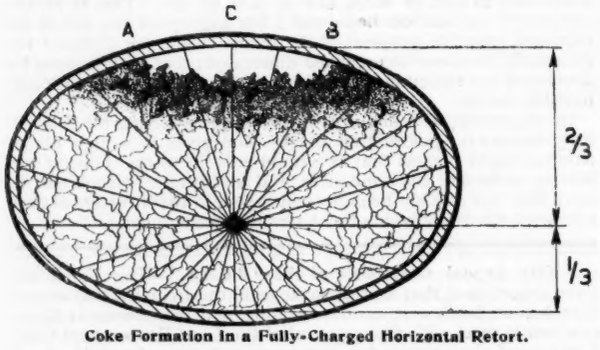
STEAMING HORIZONTAL RETORTS.

[Abstract Translation of a Paper read by Herr L. Stock before the Mid-Rhine Gas Association. From the German Gas Journal.]

In his introduction the author referred to the advantages of the "Goffin" process, which is the subject of his paper, from the point of view especially of medium and small gas-works, which can enlarge the scope of their existing plant without great capital outlay. Herr Goffin, of the Frankfurt Gas-Works, had for some time been experimenting with the steaming of horizontal retorts; and the author considers that the process now described surpasses in efficiency any previous efforts of his own or others. He recognized straight away what horizontals must be able to do in order to compete with other retort systems. He approached several firms at the beginning; but they were unwilling to give any guarantees when they learned that his system dealt with the steaming of retorts. The firm of Martin and Pagenstecher, of Köln-Mülheim, eventually entered into a working arrangement with Herr Goffin, and evolved most successfully the present process, which, it is claimed, in addition to producing water gas, embodies other equally important advantages.

The author points out that the process was no mere war-time expedient, but was brought out for pre-war conditions. The circumstances of to-day, however, make it still more important. The principles of the process are patented. Its chief characteristics are: An improvement in the efficiency of retort-settings; economy in wages; using-up waste heat and a part of the heat units of the coke; simultaneously producing water gas.

The increased efficiency of the retorts is achieved in part by choosing the most favourable cross-section, using in some circumstances small chambers, and having retorts as long as possible, but also by full-capacity charges. The argument advanced on all sides—that fully-charged retorts must crack when the coal expanded—was met by pointing out the case of vertical retorts. They are not only fully charged, but the lower part is even under considerable pressure. Are full charges of any advantage? It stands to reason, in the first place, that they must minimize losses during charging. In the second place, if the charge is greater, the proportionately greater make of gas must force its way with increased velocity through the limited space in the retort, with the result that the valuable heavy hydrocarbons, which have previously been liable to disintegration, are saved. The output is increased; and thick tar, carbon deposits, and naphthalene are reduced to a minimum. Also by full charges it is possible to avoid the uneven heating which is generally a natural consequence of horizontal retort construction, by which the top part of the retort tends towards overheating the gas, which is a fruitful source of losses. How this comes about can be seen by reference to the diagram.



Coke Formation in a Fully-Charged Horizontal Retort.

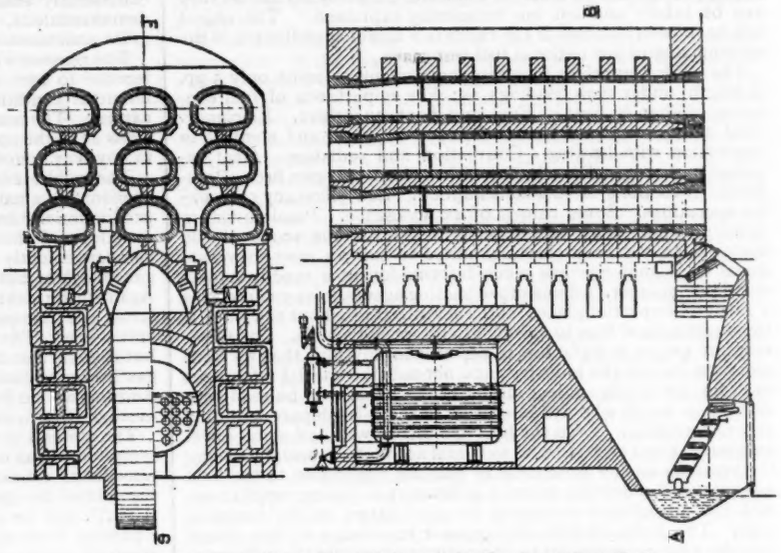
The originators of this process found that the heart of the coke in a fully-charged retort is at about one-third of the height of the retort; and this was confirmed by the Karlsruhe Experimental Institute, who published the results of experiments on the subject in 1919. This discovery, the author claims, is of great importance, since it shows exactly what has to be aimed at both in the construction and the working of horizontal retorts. It shows clearly that more heat comes from above than from below, and also that the time required to carbonize full charges is not much more than for half or lighter charges. The following table, compiled from the average figures of several retort systems, shows clearly the increased efficiency with heavy charges:

Retorts 11 *ft.* 6 *in. by* 15 *in. by* 23 *in.*

Charges . . . . . Cwt.	3	4	5	8
Carbonization period . Hours	4½	5½	6	7½
Daily capacity . . . Cwt.	17	17½	20	25½

It is pointed out that fully-charged horizontal retorts can only be discharged by pushing from one end, so that through-retorts are essential, and other systems must be considered as out of date. As regards the conditions influencing the gas during its exit from the full retort, horizontals have a distinct advantage over verticals. With the latter, the gas formed at the bottom, where the highest temperatures prevail, has to find its way up through a column of coal several feet high. With horizontals, it has at the worst only a foot of loose and easily penetrable coal to pass through. At the top is bound to exist a free passage, owing to the shape of the retort. This free space is of importance for water-gas production, as is shown later.

In small works, charging can be carried out as before, either merely by hand, or with hand charging machines. But in larger works, naturally mechanical charging is a paying proposition—still more so since the present process, with its larger carbonizing periods, enables work to be carried on with only two shifts. Only large works with chamber ovens and verticals are in this happy position; and they have had to expend large capital sums upon their plant.



Sections of the Goffin Retort-Setting at the Frankfurt Gas-Works.

A source of very considerable losses in gas-works has always been the high temperature at which the waste gases have been allowed to leave the retort-house. Efforts to recover this heat have only been successful in isolated cases, and, even if much importance was not attached to the loss in pre-war days, it is quite different to-day. In the present process, if it is a question of new plant, a low-pressure boiler is built-in with the settings to use up the waste heat. If old settings are to be used, a boiler can be installed either to produce just enough steam for the Goffin process, or to use-up the whole of the waste heat. In the latter case, any surplus steam can be used for heating baths or buildings, or for any other purpose on the works.

But the importance of the process to-day lies chiefly in the production of water gas. On an average, 425 c.ft. of coal gas are produced in an hour from one retort. To make each cubic foot of it requires 225 B.Th.U.; and for a cubic metre of water gas, the following heat units are needed:

1.—To heat water from 15° to 111° C. (1·5 atmospheres) . . . . . $\frac{96}{2{\cdot}5} = 38$ calories.

2.—To convert the water into steam of 1·5 atmospheres . . . . . $\frac{529}{2{\cdot}5} = 210$ calories.

3.—To superheat the steam to 900° C. . . . . 140 calories.

4.—To decompose the steam (having regard to the simultaneous formation of CO) . $\frac{58{,}000 - 28{,}800}{44{\cdot}8} = 650$ calories.

[The equivalents to these values in B.Th.U. per cubic foot are: (1) 4·3, (2) 23·6, (3) 15·7, (4) 72·9.]

The heat units for (1) and (2) are supplied by the waste gases, so that only (3) and (4) have to be supplied actually in the retort—*i.e.*, by the oven fuel. Taking 65 p.ct. as an average efficiency of retort-settings, then $\frac{790}{0{\cdot}65}$ calories (137 B.Th.U. per c.ft.) have to be supplied—that is to say, only 60 p.ct. of the heat required to make the same quantity of coal gas. This comparatively low figure for heat required enables us to produce water gas at the same time as coal gas, without lowering the temperature in the retort. The extra heat to be supplied by the fuel is so small that it can hardly be established in terms of weight of coke.

What takes place in the retort is particularly interesting. The author hopes to have shown, by his remarks above, that the view commonly held—that the retort, when steamed, must be first hot and then cold—is incorrect. Very little extra heat is required to

avoid variations of temperature entirely. The passage taken through the retort by the steam during its transformation is the line of least resistance. Bearing this in mind, it is obvious why, in the Goffin process, steam of quite low tension (0·3 of an atmosphere) suffices, instead of the high-pressure steam that is generally used. It can also be understood why, in ordinary water-gas producers, small coke cannot be used. Naturally the steam does not penetrate the lumps of coke, but finds its way between them. Most of the steam goes through the larger spaces; and it is here that cooling first sets in, and carbon dioxide is formed. This, too, is why with verticals steaming cannot usually begin until seven or eight hours after charging, whereas with the present system it can sometimes begin at once, or at any rate after the first hour. With verticals, there is no passage for the steam until the coking of the coal from the outside begins to leave a space between it and the wall of the retort.

With horizontals, it is a different matter. As already mentioned, there is a free space at the top of the retort. This forms an outlet for the coal gas, which extends along the whole length of the retort, and to reach which the gas has only to pass through a thin seam of coal which offers much less resistance than the long column in a vertical retort. It would be ideal as a passage for the coal gas, were it not that the bare wall of the retort at the top tends constantly to overheating. But it is precisely this tendency which supplies the heat required for the formation of water gas. The steam also uses this free passage, where it is heated up to the reaction temperature, and where the resultant water gas mixes with the coal gas, which comes up through the coal at right angles to the direction of the stream of water gas. A particular advantage of the process is the tendency of the free oxygen arising out of the decomposition of the steam to combine with the flaky carbon in process of formation in the retort and with part of the thick tar. The carbon monoxide thus formed from carbon and thick tar must make a difference in the end to the coke consumption. The author states that several places, which have been working the Goffin process for some months, have been unable to arrive at any definite figure for the additional fuel consumption required to produce the water gas, since it is a very small and almost negligible percentage of the total.

It is scarcely necessary to say anything further about the mixing of the coal gas and the water gas, which the author considers is as regular and as intimate as can be imagined. No additional labour is required to watch and regulate it; and the retort-house hands have only to open and close the steam cocks at charging and discharging times. Nothing is left to the judgment of the men as to how far to open the cocks, since they are regulated so that they have to be wide open or quite shut. The required proportions of coal and water gas can be varied by the number of retorts steamed and by the steaming periods.

A word as to the wear of the retorts. This is in no way adversely affected by the process. On the contrary, the steadiness of temperature maintained, and the avoidance of any overheating, may fairly be assumed to improve the durability of the retorts in use.

In conclusion, the author claims that the Goffin process constitutes not only an excellent means of water-gas production, but that it also offers numerous improvements in ordinary working. Since to-day horizontal settings are constructed up to a daily output of 175,000 c.ft., the process is suitable for medium and large works. But it is especially to smaller undertakings that it is recommended as a means of competing in efficiency even with the largest.

A STUDY OF GAS-BURNERS.

By Walter M. Berry, I. V. Brumbaugh, G. F. Moulton, and G. B. Shawn.

[From a Report of the United States Bureau of Standards.]

There are a few appliances in which the character of the flame is of comparatively little importance, provided the gas is completely burned. In most cases, however, the temperature of the flame is of great importance; and one might say, in general, that the closer the atmospheric burner approaches the performance of the blast burner, the higher will be the efficiency obtained, and the wider the field of application of such burners.

Different processes will require burners of different characteristics; and to get the very best results one should have a burner designed for the particular quality and composition of gas, and for the pressure available. In domestic appliances this is, of course, impracticable; and the best that can be done is to strike a good average, and to make them so that, with re-adjustments, they will give fairly satisfactory results over widely varying conditions. In such appliances, it is essential that the heat is properly distributed; that the flame is so located as to allow complete combustion without objectionable odours and poisonous products; and that high thermal efficiency is not secured by the sacrifice of other items, such as convenience, simplicity, or safety. In industrial burners, on the other hand, where large quantities of gas are being used, the cost and inconvenience of changing the design of burners to suit the exact conditions is trifling. The design of industrial burners is worthy of greater attention than has been given to the subject.

As a very general statement, one can say that burners should have the following characteristics:

(*a*) For a given size, they should have a large capacity. Large capacity means reduction in cost of manufacture, and permits concentration of heat which usually produces greatest efficiency. Increase in the velocity of the mixture going through the burner means less heating of the burner.
(*b*) The burner should be capable of operating with a high air-gas ratio, since an air-gas ratio that approaches a theoretical mixture produces a small flame of high temperature.
(*c*) The flames should be of uniform height in all parts of the burner, so that the distribution of heat will be uniform.
(*d*) The burner must stand a considerable variation in the gas pressure, or gas rate, without giving trouble.
(*e*) The flame must not flash-back into the burner.
(*f*) The flame must not blow-off.

The velocity of flame propagation increases rapidly with increase in air-gas ratio, but decreases again before the theoretical mixture has been reached. The increase in speed of combustion is accompanied by a decrease in the size of the flame and an increase in the temperature of the flame.

Relation between the Total Port Area and the Capacity of Burners.

With pipe burners as ordinarily constructed without injecting tubes, the necessity of keeping a correct ratio between the port area and the cross-sectional area of the pipe becomes extremely important when it is desired to secure the maximum capacity from the burner and a good injection of primary air. Due to the heating of the burner and the expansion of the mixture within the burner, the capacity is reduced somewhat upon the burner being lighted, and is further reduced when an object is placed over the burner which will cause some of the heat to be reflected back upon the burner. Unless we know the average temperature of the burner, it is impossible to calculate the reduction in capacity. Just what the heating effect will be is indefinite, and will depend upon the installation; but with a little experience one should be able to make the proper allowance for the temperature effect for each condition.

Pressures in Pipe Burners.

In pipe burners all the mixture must pass the first port. The velocity of the mixture, therefore, is greatest at this point; while at the last port the velocity is *nil*. At the first port we have both velocity and static pressures; but at the last port there is, of course, no velocity pressure. The static pressure is the maximum, then, at the last port. The volume of the mixture which issues from a port is dependent upon the static pressure at that port. If the ratio of the port area to the cross-sectional area of the pipe is large, there is a wide difference in static pressures, and, consequently, in the volumes of the mixture which issues from the first and last ports.

Many of the industrial pipe burners are made at present with a port area within 5 to 10 p.ct. of the cross-sectional area of the pipe; and this works well in practice for the usual low capacity secured without injecting tubes, and where it is not necessary to have a very uniform distribution of heat. A port area of 20 p.ct., or even 40 p.ct., less than the cross-sectional area of the pipe might prove to be more satisfactory in many installations.

In designing an installation, the first thing to consider is the volume of gas that will be required for the particular operation. The next point to consider is the nature of the operation, since, if the appliance is a drying oven or any other installation requiring hot air, it will be sufficient if the gas is completely burned, and the characteristics of the flame are not so important. If, on the other hand, a hot flame is required, and especially where a large quantity of heat is needed in a small space, it is absolutely essential that much of the air required for combustion is drawn in as primary air. Increasing the primary air, however, makes it necessary to have a more definite relation between the gas rate and the port area; for a small change in rate will either cause the burner to flash-back, or the cones to blow-off.

The Liberation of Ammonia during Retorting.—According to the "Technical Review," Mr. A. J. Franks, in "Chemical and Metallurgical Engineering," discusses the theoretical factors involved in the liberation of ammonia during the retorting of mineral carbonaceous matter, and the general laws governing ammonia equilibrium. A consideration of these in detail in connection with the experiments and conclusions of previous investigators has yielded information which has been applied to the exposition of the action of steam and inert gases during carbonization. The integrity of the ammonia molecules at high temperatures and under the other conditions which obtain during carbonization is due to its extremely slow rate of dissociation and the remoteness of the conditions from equilibrium; the condition being enhanced by the presence of steam and inert gases, which carry off the ammonia before any marked decomposition can occur. In retorting at high temperatures, these conditions obtain; but the injection of steam results, in addition, in the liberation of large quantities of nascent hydrogen, which synthesizes ammonia from the nitrogenous constituents of the coke, and thus increases the yield—this ammonia also being removed by the rapidly moving gases before decomposition can occur.

GAS MAKING WITH CHEAP OXYGEN.

A STUDY OF THE AMOUNT OF OXYGEN REQUIRED AND THE VALUE OF GAS PRODUCED.

By E. A. W. Jefferies, Worcester (Mass., U.S.A.).

[A Paper read at the Annual Meeting of the New England Association of Gas Engineers.]

A very complete and masterly study of the proposed process of manufacturing city and industrial fuel gas direct in one operation, using only bituminous coal, steam, and free oxygen, was read by Prof. J. W. Cobb at the annual meeting of the Institution of Gas Engineers in London, during June, 1920, and published in the "Gas Journal" of June 8 [p. 640-647], including the free discussion following it. Of course, the success of this proposal is entirely dependent on the cheap separation of oxygen from the atmosphere, as gas engineers know, and have known for many years. The author of the above study, and all those who discussed it, recognized this happy event as the fundamental necessity, if we are ever to have gas cheap enough to use for every purpose where heat is required—both in domestic and industrial furnaces and burners, and for generation of power and heating of buildings. This hope is now advanced to the stage of practical certainty.

The method of producing oxygen cheaply is handled best by F. E. Norton in various published statements which indicate a cost ranging from 6 c. to 30 c. per 1000 c.ft., depending on the scale of operations and upon the cost of capital and labour.

The object now is to study the amount of oxygen required, and the nature and value of the gas produced, as well as its cost, from a somewhat different angle than that of the more scholarly and scientific treatment presented by Prof. Cobb. My plan is to base the deductions on good gas-producer practice, with which practice and its development I have been intimately connected in the United States for the past twenty-five years. Messrs. Cobb and Hodsman studied the problem by means of data drawn from the usual retort or carbonization process as used in gas-works, where the conditions differ greatly from those prevailing in the proposed direct process, in which both carbonization and distillation go on together continuously in one vessel, by actual contact between the fuel and the oxidizing agents intimately associated. That "vessel" is the modern gas-producer or producer-gas machine; and the new process is substantially identical with producer-gas practice, excepting that the nitrogen has been removed from the blast, leaving only a gentle current of steam and oxygen.

It therefore appears reasonable that good gas-producer practice should afford data worth studying carefully as a basis for the performance of the new process, if it may be so called. There will, of course, be differences caused by removing the nitrogen; but they will be favourable differences. The volume of the gas being reduced 50 p.ct. by the removal of nitrogen, and the lowering of the temperature by the use of a deeper fuel bed, will materially diminish the loss from sensible heat carried away wastefully. Then, too, the deeper fire zone gives longer contact between the carbon and the oxidizing agents, and will therefore bring about considerable diminution in the percentage of CO_2, which latter is always dead-loss. [See Note No. 4.] I cannot, however, share the hope that CO_2 is reducible to the point suggested by Prof. Cobb's data, and have assumed 3 p.ct. as a more practicable figure. I have also assumed that the nitrogen content will not turn out to be less than 2 p.ct., instead of 1 p.ct. Also, that the higher temperature of distillation as compared with retorting will reduce the quantity of condensable tar vapour. It is not my intention that these remarks should be interpreted as in the slightest degree critical of the splendid work of Messrs. Cobb and Hodsman, for which I have the greatest respect, believing that their courage in presenting it at this propitious time will redound greatly to their credit ere long, and probably mark the beginning of a new epoch in the all-absorbing problem of fuel economy—an epoch especially favourable to the fortunes of those (whether individuals or communities) whose investments are now tied-up in gas properties which are facing destructive competition.

First, with reference to the quantity of oxygen required, we must necessarily indulge in a little elementary chemistry. [See Study No. 1.] This study shows that to oxidize the carbon in a good grade of gas coal containing 60 p.ct. of fixed carbon, 34 p.ct. of volatiles, and 6 p.ct. of ash, we must supply for every 100 lbs. of dry coal 30 lbs. of dry steam and 640 c.ft. of oxygen (measured at 0° C.).* Should Prof. Cobb's estimate regarding CO_2 prove attainable, then this quantity of oxygen will be reduced to 600 c.ft.

The same study also shows that, from the fixed carbon, steam, and oxygen, we shall obtain (per 100 lbs. of coal) 1710 c.ft. of carbon monoxide (CO), 600 c.ft. of hydrogen (H_2), and 90 c.ft. of carbon dioxide (CO_2); also that enough surplus heat has been provided to offset all the losses—namely, the losses by conduction through the walls of the gas-producer, by the temperature or sensible heat carried off in the hot gas, and by the heat necessary to distil the volatiles. This latter function is performed wholly by the heat of the gases generated in the lower part of the fuel-bed, serving to cool them, regenerator fashion, as they rise through the fresh fuel above. Distillation thus conserves part of the heat generated by the oxidation of the carbon which would otherwise be wasted, and may therefore be said to consume practically no fuel.

* See Note No. 1, p. 808.

Study No. 1.—*Detail Study of Weight of Fixed Gases per Pound of Coal (exclusive of Condensable Tar Vapours).*

—	1 Fixed Carbon.	2 Volatiles.	3 Steam.	4 Free Oxygen.	5 Totals. Per Lb. Coal.	6 Totals. Per 100 Ft. Gas.
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
Carbon	0·6	0·140	..	..	0·740	2·388
Oxygen	..	0·048	0·267	0·571	0·886	2·857
Hydrogen	..	0·047	0·033	..	0·080	0·258
Nitrogen	..	0·048	..	..	0·048	0·156
Totals	0·6	0·283	0·3	0·571	1·754	5·659

Note that the weights of oxygen, nitrogen, and hydrogen in the volatiles are almost identical.

$$\frac{\text{Column 5} \times 100}{\text{Column 6}} = \frac{175{\cdot}4 \text{ lb. gas per 100 lb. coal}}{5{\cdot}659 \text{ lb. gas per 100 c.ft.}} = 31 \text{ c.ft. gas per pound coal.}$$

$$\frac{\text{Column 7 above}}{\text{Column 2 below}} = \frac{4479 \text{ B.Th.U. volatile gas}}{0{\cdot}283 \text{ lb. weight volatile gas}} = 15{,}827 \text{ B.Th.U. per pound volatiles.}$$

Prof. Cobb's estimate of these losses combined is 5·1 p.ct. of the total heat energy of the coal, which, I fear, is slightly too low. However, actual facts on this point are extremely difficult to obtain. Data taken under my own observation apparently indicate only 12 p.ct. total loss in good gas-producer practice, after crediting the heat value of the tar vapours [estimated—see Prof. W. A. Bone's book, "Coal and Its Scientific Uses," p. 344]. The great reduction in CO_2 and in the volume and temperature of gases generated by the proposed means compared with the steam-air blown gas-producer, seems to warrant us, however, in figuring only about 6 p.ct. loss by heat carried away. I must, nevertheless, confess that my courage would not have been equal to placing the figure so low but for the support given by Prof. Cobb's calculations. [Note: The result works out here at 6·2 p.ct. loss; see Summary.]

So far I have only covered the oxidation of the carbon, the heat losses, and the amount of oxygen and steam required. There remains the consideration of the volatile matter, which is the most difficult factor, because there are no data known to me which strictly comply with the new conditions. The nearest approach is by certain long-continued gas-producer tests, in which the samples were collected and analyzed continuously day and night for months. These tests constitute, in respect of continuity, perhaps the most unique, comprehensive, and reliable data of this kind ever recorded. They are published by the Morgan Construction Company, of Worcester (Mass.), in their producer-gas machine catalogue; and though they do not represent the exact condition prevailing in the steam-oxygen blown gas-producer, as previously stated, yet they do represent them far more accurately than present gas-works data can do, and the corrections necessary by reason of the elimination of nitrogen, &c., are not difficult to make with a fair degree of certainty. Further, they can be checked. [See Study No. 2.]

Study No. 2.—*Detail Study of Products of Oxidation and Distillation per Pound of Coal, Exclusive of Condensible Tar Vapours.*

—	1 Per 1000 C.Ft. of Mixed Gases.	2 Mixed Gases per Pound of Coal.	3 B.Th.U. in Gases per Pound of Coal	4 Volume Oxidation Gases.	5 B.Th.U. Oxidation Gases.	6 Volume Volatile Gases.	7 B.Th.U. Volatile Gases.	8 Percentage Volatile Gases.
	C.Ft.	C.Ft.		C.Ft.		C.Ft.		
CO_2	3·0 × ·31 = 0·93	..		0·9	..	0·03	..	0·43
C_2H_4	1·4 × ·31 = 0·434	729		..	..	0·434	729	6·2
CH_4	7·6 × ·31 = 2·356	2,521		..	..	2·356	2521	33·66
H_2	28·0 × ·31 = 8·68	3,003		6·0	2076	2·68	927	38·28
CO	58·0 × ·31 = 17·98	6,167		17·1	5865	0·88	302	12·57
N	2·0 × ·31 = 0·62	..		..	..	0·62	..	8·86
Totals	100·0	31·0	12,420	24·0	7941	7·0	4479	100·0

$$\frac{\text{Column 7}}{\text{Column 6}} = \frac{4479}{7} = 640 \text{ B.Th.U. per c.ft. of fixed volatiles.}$$

$$\frac{\text{Column 5}}{\text{Column 4}} = \frac{7941}{24} = 322{\cdot}5 \text{ B.Th.U. per c.ft. of oxidation gases.}$$

$$\frac{\text{Column 3}}{\text{Column 2}} = \frac{12{,}420}{31} = 400 \text{ B.Th.U. per c.ft. of mixed gases.}$$

	B.Th.U. per 100 C.Ft. Fixed Gas.	Weight at 0° C. Lbs.	Carbon in Fixed Gas. Lbs.
CO_2 3 p.ct.	..	0·301	0·100
C_2H_4 1·4 p.ct. at 1680 B.Th.U.	2,352	0·109	0·093
CH_4 7·6 p.ct. at 1070 B.Th.U.	7,132	0·339	0·254
H_2 28·0 p.ct. at 346 B.Th.U.	9,688	0·157	..
CO 58·3 p.ct. at 343 B.Th.U.	19,894	4·530	1·941
N 2·0 p.ct.	..	0·156	..
Totals per 100 c.ft. of gas	40,066	5·659	2·388

Heat value per cubic foot = 400 B.Th.U.

The table published by Prof. Bone in his monumental work (p. 363) is also a valuable confirmation of the figures given in the

Morgan catalogue, because the table is the result of actual working and of painstaking care under personal observation, though the period covered and the continuity of the analyses were undoubtedly much less. Based on these records, and making proper corrections for the reduction in CO_2, nitrogen, and heat losses, we obtain the following results for the analysis of all the fixed gases, exclusive of condensable tar vapours. [See Note No. 2.]

The coal used in the above calculations is a good grade of Pennsylvania or West Virginia gas coal,* yielding 14,240 B.Th.U. per pound (dry), and containing 80 p.ct. of total carbon. We may assume 92·26 p.ct. of this total carbon is retained in the fixed gases, and about 7 p.ct. in the tar vapour. [See Bone, p. 144.] Thus the fixed gases from 100 lbs. of coal carrying 80 × 0·9226 = 73·8 lbs. of carbon; and as every 100 c.ft. of gas carries 2·388 lbs. of carbon, we have substantially 31 c.ft. of gas from every pound of coal [73·8 ÷ 2·388].

As the total weight of gas shown by the above table is 5·66 lbs. per 100 c.ft., the weight of fixed gas from 1 lb. of coal (31 c.ft.) must be 5·66 × 0·31 = 1·754 lbs., made up as follows:

Fixed carbon	0·600 lb.
Steam	0·300 lb.
Free oxygen	0·571 lb. (6·4 c.ft.—See Study No. 1.)
Fixed volatiles	0·283 lb. (7 0 c.ft.—See Study No. 2.)
Total	1·754 lbs. gas per pound of coal.

The efficiency of the process can now be computed.

Heat Values in One Pound of the Coal Studied.

Fixed carbon—0·600 lb. at 14,600 B.Th.U. per lb.	= 8,760 B.Th.U.	13,240 (See Study No. 2)
* Fixed volatiles—0·283 lb. at 15,830 B.Th.U. per lb.	= 4,480 B.Th.U.	
* Condensable tar—0·57 lb. at 17,544 B.Th.U. per lb.	= 1,000 B.Th.U. by difference	
Ash 0·060 lb.		
	14,240 B.Th.U. per lb. of coal	
Steam—3 lbs. at 1000 B.Th.U.	= 300 B.Th.U.	
Total heat value put into gas producer	14,540 B.Th.U. per lb. of coal	

* Total volatiles, 34 p.ct.

The volume and heating value of the gas from 1 lb. of the above coal is made up as follows:

		B.Th.U.
CO_2	0·9 c.ft.	
CO	17·1 c.ft. at 343 B.Th.U. per c.ft. = [See Study No. 1.]	5,865
H_2	6·0 c.ft. at 346 B.Th.U. per c.ft. =	2,076
Fixed volatiles	7·0 c.ft. at 640 B.Th.U. per c.ft. = [See Study No. 2.]	4,480
	31·0 c.ft.	12,421

Heat value per cubic foot: 12,421 ÷ 31 = 400 B.Th.U.

Summarizing these data, which, as stated, are based on good modern gas-producer practice, we have the following facts:

1.	Gas coal (dry)	100 lbs.
2.	Gas produced	3,100 c.ft. at 0° C.
3.	Heat value	400 B.Th.U. per c.ft.
4.	Steam used (dry)	30 lbs.
5.	Oxygen used	640 c.ft.
6.	Oxygen used per 1000 c.ft. of gas	206·5 c.ft. (640 ÷ 3·1)
7.	Condensable tar rejected	5·7 lbs. (available for bye-products)
8.	Heat value of gas / Heat value of coal (excluding condensable tar from both)	$\frac{12,420}{13,240}$ = 93 8 p.ct.
9.	Including heat of steam	$\frac{12,420}{13,540}$ = 91·7 p.ct.
10.	If condensable tar is considered lost, the ratio, including steam is	$\frac{12,420}{14,540}$ = 85·4 p.ct.

It is difficult to compare these results with those obtained by Messrs. Cobb and Hodsman, because (outside of the fact that they based their study on the present retort process) they obtained their data from an inferior gas coal yielding only 12,730 B.Th.U. per pound. Probably this was a war coal, which would not be used for gas-making purposes in normal times, because North of England mines can produce just as good coals as those of Pennsylvania. The quantity of gas per pound, however, works out at substantially the same in both cases; but naturally the better coal gives a better quality—namely, 400 B.Th.U. per c.ft., instead of 352 B.Th.U.

COST OF GAS AND OF OXYGEN.

Data on the cost of gas production by this process at the rate of 10,000,000 c.ft. per day, and of the cost of the oxygen separately, have been prepared for one of the largest Pennsylvania gas companies, based on the present high figures for capital, labour, and machinery prevailing in the United States.

Such an equipment must gasify 145 gross tons of coal per day, yielding 69,000 c.ft. of gas per ton. It must also separate at least 2,000,000 c.ft. of oxygen per day from the atmosphere, and reject 8,000,000 c.ft. of nitrogen.

The figures submitted are as follows:

(*a*)	Oxygen plant with maximum capacity of 3,000,000 c.ft. per day, machinery only, erected	$350,000
(*b*)	Gas-making plant consisting of six producer-gas machines, two steam-boilers, coal and ash handling machinery, flues and piping erected	150,000
(*c*)	Buildings, foundations, and equipment, covering all the above	100,000
(*d*)	Fund for preliminary trial runs and adjustments	50,000

* See Note No. 1, p. 808.

These figures cover all apparatus for producing the raw gas, but do not include scrubbers, washers, gasholders, exhausters, &c., which are standard equipment. It includes everything necessary to deliver the raw gas at 1-in. pressure in a main adjacent to the gas-house.

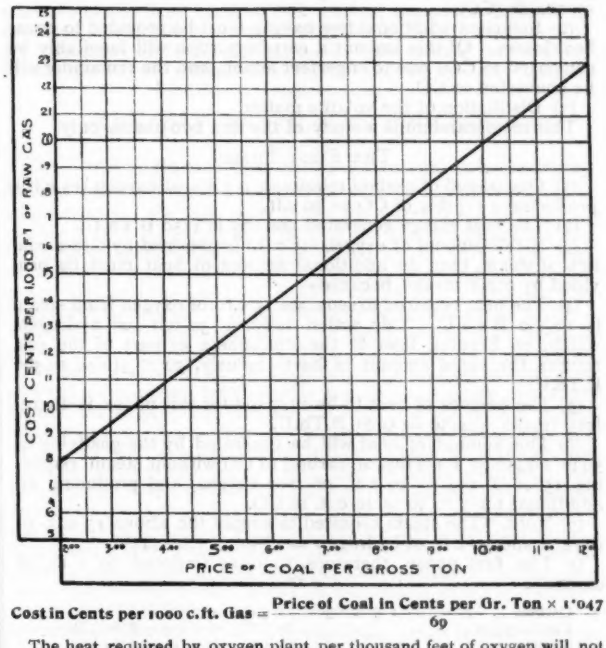
The present cost of good gas coals delivered at the given location is $4.50 per gross ton; and the gas consumption provided for is 3,400,000,000 per annum. The cost of the gas on these data works out as follows:

	Per 1000 C.Ft.
Interest on $650,000 at 7 p.ct. per annum	1.34c.
Maintenance and amortization on $500,000 at 9 p.ct. per annum	1 32c.
Coal at $4.50 per 2240 lbs. delivered (69,000 c.ft. of gas)	6.52c.
Labour on gas-producers at 55 c. per ton of coal	0.80c.
Supervision and labour to operate oxygen plant at $90 per day	0.90c.
Fuel for oxygen plant (4·7 per cent.* of coal gasified	0.32c.
Water, supplies and sundries at $40 per day (for producer and oxygen plants)	0.40c.
Total cost of raw gas	11.60c.

* See diagram.

The above figures do not include the cost of washing, purifying, and storing the gas. Neither, on the other hand, do they allow for the income obtainable from bye-products. These two items tend to balance each other, but do not come within the author's personal experience. Finally, no credit has been given for the possible value of 8,000,000 c.ft. of nitrogen daily, because there is

VARIATION IN COST OF RAW GAS WITH COST OF COAL



$$\text{Cost in Cents per 1000 c.ft. Gas} = \frac{\text{Price of Coal in Cents per Gr. Ton} \times 1{\cdot}047}{69}$$

The heat required by oxygen plant per thousand feet of oxygen will not exceed 85,000 B.Th.U. If we burn our own gas for this purpose at 90 p.ct. efficiency, we should use 85,000 ÷ (400 × 0·9) = 236 c.ft. of gas per 1000 c.ft. of oxygen—*i.e.*, per 5000 c.ft. of gas made in the producer = 4·7 p.ct.

no immediate market developed for using it. The prospect is that in the near future this bye-product of oxygen separation will have a substantial value in the production of artificial fertilizers, nitric acid, &c., when such industries are located near the gas-works. Nitrogen has also a potential value for creating a non-oxidizing atmosphere in annealing furnaces and chemical operations, when produced so cheaply in large quantities.

The cost of the oxygen itself, separated from the above data, works out as follows:

Capital cost of oxygen plant, $350,000.	
Interest, maintenance, and amortization at 16 p.ct. per annum	$56,000.00
Supervision and labour at $90 per day	32,400.00
Fuel at $32 per day	11,520.00
Supplies and sundries at $25 per day	9,000.00
Total cost per annum	$108,920.00
Total cost per day	302.50

If this plant operates at full capacity (3,000,000 c.ft. per day)	Cost per 1000 C.Ft. 10.1c.
If plant operates at 2,500,000 c.ft. per day	12.1c.
If plant operates at 2,000,000 c.ft. per day	15.1c.

Assuming 15 c. per 1000 c.ft. for the oxygen, and 200 c.ft. consumed per 1000 c.ft. of gas, the oxygen costs 3 c. per 1000 c.ft. of gas delivered to the mains.

USE NO OIL.

It therefore appears possible, from the figures submitted above, to manufacture a most desirable gas for all purposes without the

use of oil, at a cost, when properly located, even in these very expensive times, which favourably compares with the present increasing cost of natural gas. The quantity available is limited only by the supply of coal and capital; whereas the supply of natural gas is rapidly diminishing, and in many cases impossible to obtain in winter, when most needed. Further, this gas, containing large percentages of carbon monoxide and hydrogen, burns at a substantially higher temperature than natural gas, because the latter requires four times as much air to burn it; while the B.Th.U. content is only two-and-a-half times as much. [See Note No. 3.] See diagram for variation in cost of gas with cost of coal.

City gas companies may, therefore, reasonably look forward to a new era in their business, not only in the ability to meet the present demand at a very much lower cost, but principally because the field of operation is thereby broadened to cover the supply of fuel for heating houses and buildings, for operating gas-engines, and for every industry requiring it. Except for raising steam in large units, and for those greater furnace operations where producer gas made on the spot is more economical, solid coal or coke cannot possibly supply heat so cheaply and so conveniently, all things considered, as gaseous fuel carrying 400 B.Th.U. per c.ft., when sold at a fair profit over the cost of manufacture indicated by these data *plus* the cost of distribution.

STUDY NO. 1.—OXYGEN REQUIRED IN GAS MAKING.

The operation of gasifying bituminous coal with a mixture of free oxygen and steam can be considered in three phases:

(1) Sufficient of the mixture in proper proportions must be provided to convert about 80 p.ct. of the fixed carbon to carbon monoxide (CO).

(2) Sufficient additional free oxygen must be provided to cover heat losses. Of this amount a certain portion will inevitably be converted to CO_2, due to imperfect action, and the remainder will be converted to CO.

(3) Distillation of the volatile matter.

This memorandum is a study of the first two phases only.

THE FIRST PHASE.

(1) One pound of carbon requires 1 1·3 lbs. of oxygen (15 c.ft.), producing 2 1·3 lbs. of CO = 30 c.ft.

(2) The heat energy generated thereby is 4450 B.Th.U.

(3) If this amount of oxygen (15 c.ft.) is obtained by disassociation of steam, then an additional amount of heat must be provided by other means, because—

(4) The heat required to separate 15 c.ft. of oxygen from steam is 10,380 B.Th.U. This action releases 30 c.ft. of hydrogen, which, on burning later in the atmosphere as part of the gas, returns the same amount of heat—namely, 30 × 346 = 10,380 B.Th.U.

(5) The balance of heat to be supplied for this phase is therefore 10,380 − 4450 = 5930 B.Th.U.

(6) This amount of heat will be generated by the gasifying of 5930 ÷ 4450 = 1 1·3 lbs. of carbon to CO without steam, requiring 15 × 1 1·3 = 20 c.ft. of free oxygen, and producing an additional 1 1·3 × 30 = 40 c.ft. of CO.

(7) Note.—The steam required to supply the above 15 c.ft. of oxygen and 30 c.ft. of hydrogen = 1¼ lbs. [See (4).]

(8) The first phase, therefore, requires (reduced to 1 lb. of carbon):

Carbon	1 + 1 1·3 = 2 1·3 lbs.	÷ 2 1·3 = 1 lb.
Free oxygen	20 c.ft	÷ 2 1·3 = 8·60 c.ft.
Steam	1¼ lbs.	÷ 2 1·3 = 0·64 lb.
Gaseous products:		
CO	(30 + 40) = 70 c.ft.	÷ 2 1·3 = 30·00 c.ft.
Hydrogen	= 30 c.ft.	÷ 2 1·3 = 12·86 c.ft.

THE SECOND PHASE.

(9) The second phase. A total loss of at least 6 p.ct. of the heat of the fuel must be provided for.

(10) One-half of this amount—namely, 3 p.ct.—will be represented by the generation of CO_2. Assuming the final volume of gas is 30 c.ft. per pound of coal, it will therefore contain 0·9 c.ft. of CO_2.

(11) As 1 c.ft. of CO_2 requires 1 c.ft. of oxygen in its formation (and 0·033 lb. of carbon), we must supply 0·9 c.ft. of free oxygen and burn 0·03 lb. of carbon for this purpose; but as this gas leaves the producer at a low temperature, it carries away practically no heat in itself, being non-combustible.

(12) The remaining 3 p.ct. of heat loss—namely, 14,600 × 0·03 = 438 B.Th.U.—can be met by oxidizing 0·1 lb. of carbon to CO, requiring 1·5 c.ft. of free oxygen, and producing 3 c.ft. of CO (4450 ÷ 10 = 445 B.Th.U.).

(13) The second phase, therefore, requires:

	Carbon.		Oxygen.
For unavoidable generation of CO_2	0·03 lb.	..	0·9 c.ft.
For balance of heat loss (3 p.ct.)	0·10 lb.	..	1·5 c.ft.
	0·13 lb.	..	2·4 c.ft.

And the gaseous products are:

CO	3·0 c.ft.
CO_2	0·0 c.ft.

(14) The coal is assumed to contain 60 p.ct. of fixed carbon. Hence every pound of coal contains 0·6 lb. of carbon, of which 0·13 lb. is gasified by free oxygen, as described above, leaving 0·47 lb. to be oxidized by the steam and oxygen mixture.

(15) Referring back to (8), we now have the following quantities from the first phase:

	1 lb. Carbon.		0·47 Carbon.
Free oxygen	8·6 c.ft. × 0·47	=	4·0 c.ft.
Steam	0·64 lb. × 0·47	=	0·30 lb.
Gaseous products—			
CO	30·0 c.ft. × 0·47	=	14·1 c.ft.
H_2	12·86 ,, × 0·47	=	6·0 ,,
			20·1 c.ft.

(16) Adding the first and second phases (13 + 15), we have, for 1 lb. of coal:

Carbon	0·47 + 0·13 = 0·60 lb.		
Free oxygen	4·00 + 2·40 = 6·40 c.ft.		
Steam	= 0·30 lb.		
Gaseous products:			
CO	14·1 + 3 = 17·1 c.ft. at 343	=	5865 B.Th.U.
H_2	= 6·0 c.ft. at 346	=	2076 B.Th.U.
CO_2	= 0·9 c.ft.		—
Total gas from oxidation of carbon 24·0 c.ft.			7941 B.Th.U.

7941 ÷ 24 = 322·5 B.Th.U. per c.ft.

NOTE NO. 1 ON COAL ANALYSIS.

The average analysis of six leading gas coals from Western Pennsylvania, as published in Bulletin No. 22 (1913) by the Bureau of Mines at Washington, is as follows:

ANALYSIS NO. 2 (DRY) TAKEN IN EACH CASE.

Fixed carbon	59·5 p.ct.
Volatiles	34·5 ,,
Ash	6·0 ,,
Total carbon	80·0 ,,
B.Th.U.	14,440 per pound

Similar analyses of the gas-making coals from fifteen mines in West Virginia show substantially the same average, but wider variation. The gas-making coals of Pennsylvania are remarkably uniform in composition and in combined water (average 6·7 p.ct. of oxygen).

In order to provide a basis for study which will show a maximum consumption of oxygen and a safe estimate of the B.Th.U. value of gas, a slightly inferior analysis is assumed:

Fixed carbon	60·0 p.ct.
Volatiles	34·0 ,,
Ash	6·0 ,,
Total carbon	80·0 ,,
B.Th.U.	14,240 per pound.

No doubt many will object that gas coals with only 6 p.ct. of ash are not available in sufficient quantity nowadays. The variation in cost of gas due to the higher ash content of the coal would be as follows:

At 6 p.ct. ash—Cost of gas	11·6 c. per 1000 c.ft.
At 9 p.ct. ash—Cost of gas	11·8 c. ,,
At 12 p.ct. ash—Cost of gas	12·0 c. ,,

NOTE NO. 2 ON THE ANALYSIS OF THE PRODUCER GAS.

[See Morgan Construction Company's Catalogue.]

	Average Analysis. Page 13 of Catalogue.	Reduced to 2 p.ct. N.	Reduced to 3 p.ct. CO_2 by Adding 3 p.ct. to CO.	Heat Value. Column 3. (B.Th.U.)
	P.Ct.	P.Ct.	P.Ct.	
CO_2	2·80 × 2·154 = 6·0	..	3·0 ..	—
C_2H_4	0·60 × 2·154 = 1·3	..	1·3 ..	2,184
CH_4	3·50 × 2·154 = 7·5	..	7·5 ..	8,025
H_2	11·25 × 2·154 = 24·2	..	24·2 ..	8,373
CO	27·35 × 2·154 = 59·0	..	62·0 ..	21,266
N	54·50 × 2·154 = 2·0	..	2·0 ..	—
	100·0	100·0	100·0	39,848

Heat value per cubic foot = 398 B.Th.U.

	Page 15 of Catalogue. P.Ct.		P.Ct.		P.Ct.		
CO_2	3·5 × 2·04	= 7·1	..	3·0	..	—
C_2H_4	0·8 × 2·04	= 1·6	..	1·6	..	2,688
CH_4	2·7 × 2·04	= 5·5	..	5·5	..	5,885
H_2	12·0 × 2·04	= 24·5	..	24·5	..	8,477
CO	29·1 × 2·04	= 59·3	..	65·4	..	21,746
N	51·9 × 2·04	= 2·0	..	2·0	..	—
	100·0	100·0	..	100·0	..	38,796

Heat value per cubic foot = 388 B.Th.U.

As the above gases were made by the use of not over 0·2 lb. of steam per pound of coal, and as we find 0·3 lb. of steam will be absorbed when nitrogen is eliminated (as we should naturally expect, due to the diminution in sensible heat carried away in the gas), it is evident that there will be a further change in composition, because steam releases 2 c.ft. of hydrogen for every foot of oxygen. Therefore the hydrogen content of the gas will be increased at the expense of the CO, without substantial change in heat value. We should also expect some improvement in the percentage of the hydrocarbon gases, due to the additional hydrogen and the longer period of its contact with the hot fuel and nascent gases as compared with producer gas.

The extent of these changes must, however, be governed by the actual content of the fuel, both in B.Th.U. value and in the amount of the various substances convertible to fixed gas which

it contains, together with the steam and oxygen added. This balance is found in the following composition [see Study No. 2]:

	P.Ct.			
CO_2	3·3			..
C_2H_4	1·4	at 1680 =	2,352	B.Th.U.
CH_4	7·6	at 1070 =	8,132	,,
H_2	28·0	at 346 =	9,688	,,
CO	58·0	at 343 =	19,894	,,
N	2·0			..
	100·0		40,066	B.Th.U.

= 400 B.Th.U. per c.ft.

NOTE NO. 3 ON THE COMPARATIVE TEMPERATURE AND HEATING EFFICIENCY OF THE BURNING GASES.

	B.Th.U. per C.Ft. Gas.	C.Ft. Air per C.Ft. Gas.	B.Th.U. per C.Ft. Air.	Comparative Flame Temp.
Hydrogen	346 ..	2·4 ..	144 ..	2179° C.
Carbon mon. (CO)	343 ..	2·4 ..	143 ..	2238° C.
Methane (CH_4)	1,070 ..	9·6 ..	111 ..	1988° C.
Ethylene (C_2H_4)	1,680 ..	14·4 ..	116 ..	2238° C.
Carbon	14,600* ..	144·0* ..	101 ..	2200° C.

* Per Pound.

The figures given above for flame temperature are comparative only, after making all calculable allowances for volume, density, and specific heat of the products of combustion, with no allowance for loss by radiation, because heat radiated from the flame is not lost in high-temperature furnace work, but is a very important gain. For this reason, a heating gas should contain sufficient hydrocarbon to produce a certain degree of luminosity, which greatly increases the radiant effect, and consequently the rapidity with which combustion takes place.

The superior temperature and heating efficiency of water gas as compared with natural gas accords with actual experience wherever investigated, and has been testified to publicly by gas engineers with such unanimity of late years that it can no longer be questioned. Prof. Bone writes (p. 263):

> Another misconception which, judging by the frequency with which it crops-up in technical discussions, seems to be very valent, is that calorific value and calorific intensity necessarily rise or fall togetner. Thus it seems often to be assumed that a gas of calorific value (say) 500 B.Th.U. will necessarily burn with a hotter flame, and give a higher temperature in a furnace, than one of (say) 300 B.Th.U. per c.ft.; whereas it may easily be shown that such an assumption is not necessarily valid. Indeed, according to actual experience, a blue water gas of 300 B.Th.U. calorific value gives a hotter flame than does a coal gas of 500 B.Th.U.

This is an exceptionally important matter, because of its bearing on the question of the efficiency of one gas compared with another in heating operations—that is to say, how much of the total heat of combustion is usefully applied, and how much is unavoidably thrown away, in any given case. It is evident (perhaps without discussion) that the gas giving a higher temperature of combustion mixed with a smaller volume of inert nitrogen (to supply the necessary oxygen) will produce a greater heating effect in the furnace and carry away a less amount of heat in the waste products because of their smaller volume. In this important respect, the gas here studied is at least equal to the present average city gas, and is superior to natural gas.

NOTE NO. 4 ON PRODUCER GAS.

In gas-producer operation as practised in steel and glass works to heat large regenerative furnaces, the fire zone is usually less than 24 in. deep, and extends to the top of the fuel-bed. This naturally results in hot gas with high CO_2, which is carried direct into the furnace without washing. It also results in the partial decomposition of the hydrocarbons, forming soot and (if it is allowed to condense) a tough, intractable tar. On the other hand, such practice permits of a very high rate of gasification, and gives accessibility to the clinker-forming strata, which can be continuously disturbed—practical considerations which outweigh the question of gas quality for the purpose named.

When the gas is to be distributed in small pipes, it must necessarily be washed and cleansed from tar before it can be so distributed; and the practice giving best results in that case is to use a slower rate of gasification and a fire zone 36 to 48 in. deep. The gas arising therefrom is cooler and richer, the tar substance is more easily handled, and there is comparatively little soot. The disadvantage of this practice is that the clinker-forming zone is too far below the surface for effective disturbance; but mechanical methods are now being developed which give promise of overcoming this difficulty and providing reliable continuous operation.

The temperatures of the gases as generated by the several methods may be assumed approximately as follows:

Hot producer gas	1200° Fahr.
Deep fire-zone gas	600° ,,
Retort gas	200° ,,

It is self-evident that, with the elimination of nitrogen from the blast, the period and the intimacy of its contact with the hot carbon are increased many fold, thus reducing the quantity of CO_2 in the gas to the lowest possible limit; and the smaller volume and lower temperature of the gas must similarly reduce the amount of heat wasted by the process.

ESTIMATION OF WATER IN TAR.

The March 15 issue of the "Journal of the Society of Chemical Industry" summarizes the contents of an article on this subject in a recent number of the German gas journal. This urged that, owing to the great variations in the percentage of water in tar as it passes through the different receivers in tar-works, samples for estimating the water in tar-deliveries should be taken either as the tar flows into the wagons, or from the wagons themselves. In the former case a narrow, valved branch pipe, which should be vertical or sharply inclined, is attached to the delivery pipe some distance from the end; and discharges a continuous sample into a receiver. In the latter a number of samples are withdrawn from the wagons by means of an iron tube, 3 to 5 cm. in diameter, fitted with a stopper or valve at the bottom, which can be opened and closed by means of an iron rod passing down the tube. Sampling should be done soon after filling the wagon; and the total sample taken by either method must be well agitated before weighing a portion for estimating the water. Three methods are available for the water estimation—fractional distillation, vacuum distillation, and Beck's method. Distillation methods have the advantage that water, naphthalene wash-oil, and benzole wash-oil are estimated in one operation. The tar is distilled in a copper flask, fitted with a Liebig condenser until the oily distillate is free from water—*i.e.*, about 200° C.; and the volume of water is read off direct in a measuring cylinder. The addition of 10 p.ct. of zylol and some pumice stone to the tar facilitates the distillation and prevents bumping. Decomposition of the tar is reduced if the distillation is carried out under vacuum; but frothing of the contents of the flask renders this method somewhat difficult to operate. The tar is first heated till it begins to boil under ordinary pressure; and the distillation is then carried out without further heating by gradually raising the vacuum to about 700 mm.

THE DAYTON OIL-GAS PROCESS.

The Dayton American process of gas manufacture is essentially an air-oil gas system, in which partial combustion of certain constituents of the oil takes place within the retort or reaction chamber itself, thus supplying internally all the heat necessary for the thermal decomposition of the hydrocarbons. It is said that over 88 p.ct. of the heat in the oil is obtained in a usable form as gas or tar; and the fact that no external heating is required distinguishes this from all other methods of artificial gas making. The only raw material necessary is a liquid hydrocarbon, such as gas oil or fuel oil, which is atomized and mixed with preheated air in predetermined and automatically-maintained proportions, and fed continuously into suitable retorts or reaction chambers located within properly insulated settings. In the retorts partial combustion of the carbon and hydrogen takes place with the oxygen of the air, generating sufficient heat to maintain the reaction temperature continuously, and to make good heat lost through radiation and combustion, and the sensible heat carried out in the hot gases. This partial combustion is sufficient to carry out as carbon monoxide or carbon dioxide the portion of carbon which would otherwise be deposited as lampblack. By this method of production there is, it is claimed, delivered as a combustible practically all the carbon of the oil, the loss of which in ordinary destructive distillation and carburetting processes produces a lowering of efficiency. As the lampblack carbon is burned within the retort, there can be no clogging.

Furnishing particulars of the process to the Pittsburgh Section of the American Chemical Society, Mr. F. C. Binnell pointed out that it provides a substantial and simple apparatus for the manufacture of gas which is easily controllable within the heat-unit range of commercial uses. The oil and air adjustments on the atomizer are initially made for the particular grade of gas desired; and when this is done, the ratio of air to oil cannot vary. The limits within which gas may be produced continuously are about 300 to 560 B.Th.U. Above the latter figure, some external heating is necessary. The production of 450 to 500 B.Th.U. gas produces a maximum efficiency thermally, and allows the maximum production per unit of time. With 4 gallons of residuum or fuel oil, 1000 c.ft. gas of this quality can be made. Besides this, conditions which result in the production of such a gas bring about bye-products in desirable quantity and quality. The air supplied for the partial combustion during the gas-making stage is preheated by the hot gases leaving the retort; and this preheated air is intimately mixed with the oil at the atomizer, and supplied through a pipe together with the oil into the centre of the retort. In this way complete vaporization of the oil and admixture with the air is ensured before entering the hot zone; and there is no decomposition of the oil in the liquid phase to augment carbon deposition. The large percentage of inert nitrogen in the air supplied for partial combustion brings about a lowering of the partial pressure of the hydrocarbons in the gaseous state, which promotes the formation of unsaturated hydrocarbons.

The evils of smoke are emphasized by a series of striking photographs in issue No. 85 of the "B.C.G.A.'s" publication "A Thousand-and-One Uses for Gas," which proceeds to point out the remedy, as suggested in the evidence of witnesses before the Ministry of Health's Departmental Committee on Smoke and Noxious Vapours Abatement.

REGISTER OF PATENTS.

Incandescent Gas-Mantles.—No. 158,779.

Marshall, W., of Cheadle Hulme.

No. 31,853 ; Dec. 19, 1919.

This invention relates to the manufacture of mantles from artificial silk acetyl-cellulose—the patentees claiming to have discovered that the suitability of acetyl-cellulose for such mantles can be materially improved by de-acetylation, and that mantles made from acetyl-cellulose from which the acetyl groups have been removed give improved results.

He says : The absorbent power or properties of the material after the acetyl group has been removed are increased ; and the behaviour of the material in subsequent operations (such as burning-off) is favourably modified. The de-acetylation is effected by treating the material or the mantle with solutions of the hydroxides, carbonates, or silicates of sodium or potassium (or a mixture of them) or any other suitable reagent of sufficient strength at a temperature below 212° Fahr. for a period of from ten to thirty minutes.

This de-acetylation may be either partial or complete, according to the strength of the de-acetylating agent, and may be carried out before or after the knitting or weaving process—preferably after.

For example, the acetyl-cellulose in the form of hanks or knitted fabric is treated with a 20° to 30° Twaddel solution of sodium hydroxide at a temperature of 200° Fahr. for ten to thirty minutes. It is then washed or treated with hydrochloric acid of 20° Twaddel and again washed until free from soluble matter, and dried. The material is now ready for impregnating in the usual manner with thorium and cerium nitrates.

Manufacturing Blue Water Gas in Conjunction with Coal Gas.—No. 149,928.

Lowe, J., of Auckland, New Zealand.

No. 30,117 ; Dec., 1919. Convention date, Aug. 19, 1919.

According to this invention the plant comprises twin generators or producers arranged so that blue water gas is made in one generator while the fire in the other generator is being blown-up or revivified with air—equal water gas and producer gas making periods of time alternating in each generator so that a continuous production of the two gases is kept up. The valves of the generators are adapted to be simultaneously operated, and may also be operated automatically.

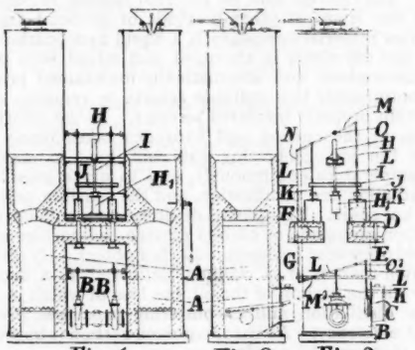


Fig. 1.

Fig. 2. Fig. 3.

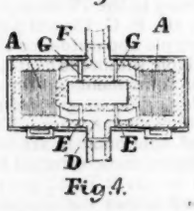


Fig. 4.

Lowe's Combined Blue Water Gas and Coal Gas Plant.

Fig. 1 is a transverse sectional elevation through one unit of plant consisting of two generators or producers. Fig. 2 is a transverse sectional elevation through one generator. Fig. 3 is a transverse elevation showing valves and dampers and also the flues in section. Fig. 4 is a sectional plan on a plane cutting the water gas and producer gas flues.

The brick-lined generators or producers A are provided with a flue F for conveying to the retorts the water gas made during the gas-making periods. The pipe has valves or dampers G to control the flow of gas from either generator. The producers are also provided with a flue D having therein dampers E for conveying the producer gas made in the periods of revivification to the furnaces or to any desired place. Each generator is provided with an air-valve B and a steam-valve C. The valves and dampers are connected so that while the steam-valve C and the water-gas damper G are open on a generator the air valve B and the producer gas damper E are closed on the same generator but open on the other generator.

One method of connecting the valves and dampers by link-work and applying hydraulic power for their operation is as follows: H and H_1 are hydraulic cylinders acting in opposition to each other on one piston rod I. These cylinders are connected to a hydraulic pressure valve [not shown] so that water under pressure is admitted into one cylinder while the other is open to exhaust. The piston rod carries a crosshead J connected to the damper rods of two diagonally opposite dampers—that is to say, the crosshead J is connected to the rod on the damper G of one generator and the rod of the damper E on the other generator.

Fig. 3 shows the link-work connections to the valves and dampers on one generator ; and the arrangement of connections on the other generator is exactly the same except that the valves and dampers are in the opposite positions on the other generator.

The four rods K attached to the dampers and valves are connected to swinging levers M and M_1, pivoted at O and O_1, by connecting rods L and coupled together by a rod N. The connection between the link-work system on one generator and the other is made by the crosshead J, which (as has already been said) is connected to a pair of diagonally opposite damper rods K. Thus, when the piston of the hydraulic cylinders takes a stroke, all valves and dampers are thrown from one position to the other—those which are open being closed and *vice versa*.

The plant could be combined with an installation of retorts for the carbonization of coal so that gas made in the blue water gas plant is caused to pass through the gas-retorts in which coal is being carbonized or is introduced into the stream of coal gas at any stage in the manufacturing process.

The employment of a relief gasholder is said to be unnecessary with this plant ; and the introduction of hot newly-made water gas to town's gas during manufacture is greatly facilitated.

Treating Coal Tar.—No. 158,337.

Anderson, W., of Helensburgh, and Meikle, J., of Maryhill, Glasgow.

No. 26,759 ; Oct. 31, 1919.

The operations comprising the process referred to are : Effecting vaporization of tar by injecting it into and through a tubular heater by means of superheated steam in excess of that required to supply the heat necessary to effect the complete vaporization of the tar at the temperature selected ; depositing any carbon formed so as to effect practically complete separation of carbon ; condensing the vapours.

It is found, in practice, the patentees say, that satisfactory results are obtained when the temperature of the superheated steam is adjusted so that the supposed interaction takes place between 450° and 600° C. The vapour and steam are allowed to flow together through a length of tubing sufficient to allow the interaction to develop. In a practical instance, 72 ft. of tubing of a diameter of 5 in. have been found sufficient—the rate of flow being such as to distil 20 tons of tar in twenty-four hours.

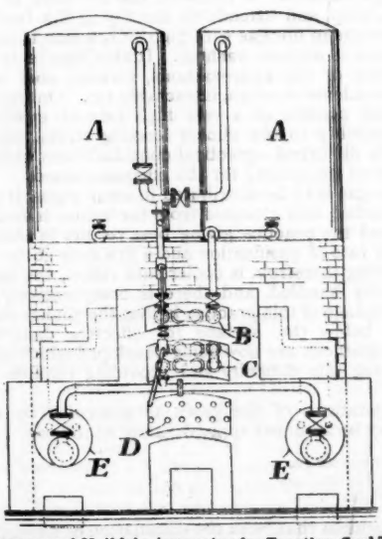
In order that the solid product referred to may be recovered free from solid carbon, it is necessary next to permit the deposition of carbon in what may be considered an expansion chamber connected to the tubing. In this chamber adiabatic or isothermal expansion may be effected and the rate of flow retarded, in consequence of which deposition of pure carbon is effected in the chamber. The vapours are next passed to a series of condensers so arranged as to effect fractional condensation at any desired series of temperatures. The first of these condensers collects the solid body, while the liquid will collect in subsequent condensers.

In treating in this manner coal tar derived from the distillation of coal in Glover-West vertical gas-retorts, the following have been obtained :

Liquid product, entirely free of naphthalene	49	p.ct. by weight.
Solid product	35	,, ,,
Carbon	7	,, ,,
Gas	9	,, ,,

The liquid product (similar in appearance to ordinary coal-tar creosote) may be treated in the same way as the original material—*i.e.*, subjected to the action of superheated steam at a temperature between approximately 450° and 600° C., when it is in turn converted into a liquid portion, a solid portion, carbon, and gas.

Apparatus for the performance of the process is illustrated in front elevation.



Anderson and Meikle's Apparatus for Treating Coal Tar.

A are reservoirs from which the tar is led by valved piping to tubes B, where the tar is preheated and whence it passes to the series of tubes C into which it is injected in vaporous form by superheated steam sup-

plied from the superheater D. The vapours then pass into the chamber E. A steam-pipe introduces into the chamber steam flowing in the direction opposed to that of the vapour entering it. From E the vapours pass to condensers, in which fractional condensation is effected; thence to a final collecting tank, and to the gas outlet.

The patentees point out that the process is not a hydrogenation process, and that they do not seek to produce any oils lighter than those contained as such in the tar before treatment. The state of knowledge at the present day is not such as to justify any explanation as to why the products which result from the process are obtained and why others working on somewhat similar lines obtain light hydrocarbons. It is a fact, however, that by following the directions given there will be obtained the products which they aim at producing.

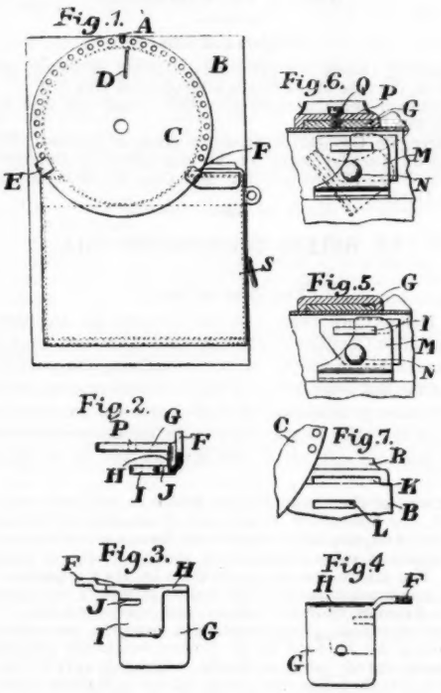
Coin-Freed Gas-Meters.—No. 158,666.

GLOVER, W. R., of Angel Road, Edmonton, N.

No. 27,541; Nov. 7, 1919.

This invention relates to gas-meter coin-freed mechanism, in which a price-changer plate or disc is employed, as in patent No. 25,272 of 1894.

Heretofore various means have been employed for locking such price-changer plate to the casing; such means consisting in some cases of a hinged lever passing across the plate and padlocked or in positioning the plate within a hooked lug or lugs and employing a removable catch-piece which engages the edge and a hole in the plate and is secured to the casing. My present invention consists in the construction of such last means for locking such price-changer plate in an improved manner and as hereafter described.



Glover's Coin-Freed Gas-Meter.

Fig. 1 is an elevation of a price-changer plate and the casing by which it and the coin-box are carried. Fig. 2 is one edge view of the catch for locking the price-changer plate. Fig. 3 is a side view of the catch. Fig. 4 is an opposite view of the catch. Fig. 5 is a section of a portion of the casing showing two members of the catch—one in section and the other locked by the L lever. Fig. 6 is a section of a portion of the casing, showing the catch and its L-shaped lever combined with the screw means of locking the catch. Fig. 7 is a fragmentary elevation of the casing and price-changer plate showing the two slots for the catch.

The usual hook A is employed on the casing B, and on it the price-changer plate C is hung to determine the number of feet of gas to be supplied for the coin inserted in the slot D. Two other hooked catches are supplied—one E being fixed to the casing and engaging the edge of the disc C, while the other improved construction of catch with its nose piece F is removable. When applied, however, it engages the edge of the price changer or disc C—the hook A and the two catches E, F being positioned preferably triangularwise, so as to engage and hold the disc at equal distances from each other.

Figs. 1, 2, 3, 4, 5, and 7 show one method of application, in which the catch is locked from inside the meter-casing. On the casing B next the price-changer plate C and near the lower part on the opposite side to the fixed stop E, there are formed two openings K, L, positioned parallel to each other and capable of receiving the flat-piece G and strip of metal I of the removable catch. Inside the casing B is pivoted an L-shaped lever M capable of being moved so that when the catch is engaged with the slot it can be moved about its pivot N for one member to engage the slot J in the catch-piece and hold it firmly to the casing, as at fig. 5—the catch being positioned so that its two flat portions G I are in their respective openings K L with the nose-piece F resting against and engaging the price-changer plate C. On a reversal of the lever M, as shown in dotted lines in fig. 6, the catch can be removed.

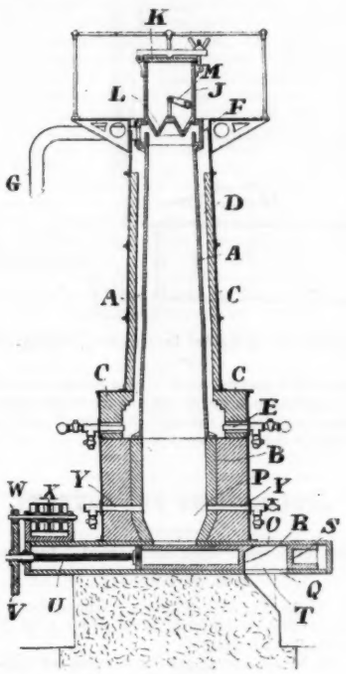
The L-shaped lever is positioned inside the casing and preferably pivoted to a plate soldered to the wall of the casing; and the part where the lever is pivoted is enclosed by the coin-box S or a door to be locked by the gas company's attendant.

Carbonization of Coal, Shale, &c.—No. 158,622.

BALE, G. F., of Featherstone Buildings, W.C.

No. 27,090; Nov. 4, 1919.

This invention relates to apparatus for coal carbonization, including in combination an inner and an outer vertical shaft separated by a heating space, a trunk or the like forming a chamber communicating with the inner shaft, which serves to collect distillate and to prevent it from returning by gravity to the inner shaft, and means adapted automatically to remove at intervals from the base of the retort a predetermined quantity of carbonized material.



Bale's Vertical Carbonization System.

The arrangement, as shown, consists of a vertical cast-iron tube A, slightly tapered, placed with its larger end downwards on a firebrick setting B, which is so shaped as to constitute an extension of the bore of the tube for a further length equal to about one-third. From the point where the tube joins the firebrick setting, an external firebrick casing C is built up round the tube for nearly the whole of its length, and is so arranged as to leave an annular space D round the tube. Gas-burners E project through the firebrick C towards the tube A for the purpose of heating it externally. On the small end of the tube is mounted an annular cast-iron trunk F, forming a collecting chamber with its near side so cut away as to provide an opening into the tube. A pipe G is connected with this trunk to convey away the volatile and gaseous products (liquid and semi-solid) collected within the trunk and thus prevented from falling back within the inner retort shaft.

On the top of the trunk is mounted a hopper J with a gas-tight lid K and a bottom valve L which is operated by a lever M for the purpose of feeding the tube with the material to be treated.

Beneath the setting at the lower end of the tube is fixed a horizontal cast-iron box of rectangular section having in its top side a circular hole P of the same diameter as the hole formed by the firebrick setting with which it coincides. At one end of the box and in its bottom side is another hole Q, of about the same area as the first. Within the box is a hollow iron ram R coupled to an iron block S, and so arranged that a space T exists between the ram and the block. The block follows the ram in its movements to and fro in the iron box or casing. The ram is operated by a horizontal screw U, which projects through one end of the box and is driven by gear wheels V, W, driven by a shaft on which is mounted a fixed pulley X with a loose pulley on either side of it. The pulleys are so arranged that normally one belt rotates one loose pulley in one direction while the other belt (which is crossed) rotates the other pulley in the opposite direction. A fork or guide is arranged to move the belts alternately on to the fixed pulley at predetermined times, thus giving a clockwise and counterclockwise motion to the gear wheels, and therefore a reciprocating motion to the ram.

At each end of the box O is fixed a trigger; the two triggers being coupled by rods and balance weights to the belt forks in such a manner that when the ram has travelled the required distance within the casing it operates one of the triggers, which in turn moves the other belt on to the fixed pulley and thus reverses the direction of the ram.

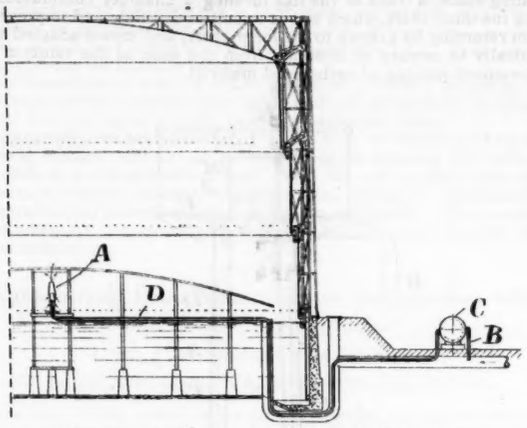
Collection of Gases in Chambers.—No. 158,758.

Carpenter, C. C., of the South Metropolitan Gas Company.

No. 30,243; Dec. 3, 1919.

When gases of different composition or temperature are collected in the same chamber—for instance a gasholder—it frequently happens, the patentee remarks, that some time elapses before diffusion has proceeded so far that there is uniformity of composition throughout the contents of the holder or other chamber. The proposal in the present invention is for an injector to be so placed in the gasholder or other chamber that when in operation it produces thorough agitation of the gas, "causing the desired intermixture in a comparatively short time."

The injector may be operated by some of the gas already collected, or being collected, in the holder. Preferably a compressor withdraws some of the gas from the holder and returns it through the injector, which may be placed at the lower part of the gas space more or less in the axial line of the holder.



Carpenter's Gasholder Intermixing Arrangement.

The illustration is a vertical section of a holder containing an injector nozzle A operated by some of the gas from the main that delivers gas to the holder, withdrawn through the pipe B and compressed by the pump C to issue through the pipe D.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for March 23.]

Nos. 7910 to 8633.

Adam, W. G.—"Production of amino phenols, &c." No. 8604.

Adam, W. G.—"Plastic material, and process of preparing same from tar distillates." No. 8605.

Bäckström, H. M.—"Apparatus for carrying out highly-exothermic catalytic reactions between gases." No. 8090.

Bartlett, A. J.—"Incandescent burners." No. 8105.

Benn, C., C. H., & C. L.—"Tar-distillation, &c., stills." No 8432.

Bucknall, J.—"Gas-heated water-heating apparatus." No. 8328.

Cederberg, I. W.—See Bäckström, H. M. No. 8090.

Cederholm, H. S.—"Gas-igniters." No. 8251.

Chapelle, O.—"Gas-cooker." No. 8078.

Davies, H.—"Gas cooking-ovens." No. 7995.

Dolphin, J.—"Atmospheric gas-burners." No. 8206.

Flavel, P. W.—"Combined fire-place and cooking-stove, with means for heating by gas." No. 8402.

Galbraith, W. L.—See Adam, W. G. Nos. 8604-5.

Griffiths, E. A.—"Apparatus for evolving gases from liquids." No. 8335.

Hartley, H.—See Davies, H. No. 7995.

Harvey, F.—See Davies, H. No. 7995.

Howlett & Co., Ltd., M.—See Dolphin, J. No. 8206.

Jones, A. C.—"Means for securing globes, shades, &c., for incandescent gas-burners, &c." No. 8056.

Kimber, J.—"Destructive distillation of shale, &c." No. 8268.

Mason, F.—"Retort internally heated by gaseous fuel." No. 8324.

Messenger & Sons.—See Jones, A. C. No. 8056.

Parrish, P.—"Manufacture of ammonium sulphate." No. 8515.

Paterson, J. H.—"Gas-producers." No. 8220.

Petzel, G.—"Bodies for filling columns, towers, &c., through which gas is passed in an opposite direction to liquid." No. 8274.

Radiation, Ltd.—See Davies, H. No. 7995.

Rolls, S. C.—"Pipe joints." No. 8398.

Siderfin, N. E.—See Adam, W. G. Nos. 8604-5.

Smith, D. J.—See Paterson, J. H. No. 8220.

South Metropolitan Gas Company.—See Parrish, P. No. 8515.

Southon, J.—"Automatic regulator for gas-rings." No. 8459.

Stubbs, S. P.—See Jones, A. C. No. 8056.

Tallantyre, S. B.—See Adam, W. G. No. 8605.

Tilley, F. C.—"Inverted gas-lamps." No. 8382.

Tulloch, T. G.—See Smith, D. J. No. 8220.

Walker, R. T.—See Kimber, J. No. 8268.

Weight, O. W.—See Parrish, P. No. 8515.

Wilson Gas-Meters, Ltd., G.—"Coin-controlled operating mechanism for gas-meters, &c." No. 8526.

Wilson, J. H.—See Wilson Gas-Meters, Ltd. No. 8526.

Wilson, W. A.—See Davies, H. No. 7995.

Yates, H. J.—See Davies, H. No. 7995.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

The Waltham and Cheshunt Gas Bill: Read the third time, passed, and sent to the Commons.

The Nelson Corporation Bill: Reported, with amendments.

Coal Mines (Decontrol) Bill: Read a second time, and committed to a Committee of the Whole House. Bill reported without amendment, read the third time, and passed. It received the Royal Assent last Thursday.

It was moved to resolve, and agreed to, that it was desirable that the Rhymney and Aber Valleys Gas and Water Bill (among others) be referred to a Joint Committee of both Houses.

The Wandsworth, Wimbledon, and Epsom District Gas Bill is among a group of Bills to be considered on Wednesday, April 13, by the following Select Committee: Duke of Bedford (Chairman), Viscount Hood, Lord Walsingham, Lord Sackville, and Lord Redesdale.

The Manchester Corporation (General Powers) Bill is to be considered on Wednesday, April 20, by the following Select Committee: Earl Craven, Lord Monteagle, Lord Wemyss, Lord Ebury, Lord Strathspey.

The Tendring Hundred Water and Gas Bill is to be considered on Wednesday, April 13, by the following Select Committee: Marquis of Bristol (Chairman), Lord Erskine, Lord Fairfax, Lord Greville, Lord O'Hagan.

HOUSE OF COMMONS.

Progress of Bills.

The Standing Orders not previously inquired into have been complied with in the case of the South Metropolitan Gas Bill.

The Waltham and Cheshunt Gas Bill: Read the first time, and referred to the Examiners.

The Harrogate Gas Bill is among a group of Opposed Bills to be considered on Tuesday, April 12, by the following Committee: Sir Sir Francis Blake (Chairman), Mr. Mallalieu, Sir Douglas Hall, and Mr. Evan Davies.

ST. HELENS CORPORATION BILL.

The Price of Gas.

The St. Helens Corporation Bill has occupied the attention of the Local Legislation Committee of the House of Commons, presided over by Sir William Middlebrook, several days during the past two weeks. Part IV. of the Bill deals with gas, water, and electricity, and was unopposed. Clause 51 relates to the price of gas, and provides that from June 30 next the price of gas supplied by the Corporation shall not exceed 6s. per 1000 c.ft. within the borough and 6s. 6d. outside the borough.

Mr. Bailey (for the promoters), on March 22, said that, with regard to clause 51, the Ministry of Health had observed that the Committee would no doubt require to be satisfied that there were sufficient grounds for the differential price proposed for the supply of gas outside the borough. The clause was an application by the Corporation to increase the maximum charge for the supply of gas, in consequence of the increased cost of materials, labour, and everything else. It arose in these circumstances. The Corporation were the purveyors of gas not only within the borough of St. Helens, but in the adjoining districts—namely, the township of Windle, which was part of the parish of Eccleston, and the urban districts of Ashton-in-Makerfield and Haydock. For years they had been supplying gas in Ashton. The difference in the maximum price within and without St. Helens had been 6d. under the earlier Act—*i.e.*, the price to the consumer in the borough had been 4s. per 1000 c.ft. by the St. Helens Improvement Act of 1869, and outside the borough 4s. 6d. The maximum price asked for in the Bill—namely, 6s. and 6s. 6d.—thus maintained the same difference between the consumers within and without St. Helens.

Mr. *Samuel Glover* (Gas Engineer to the St. Helens Corporation), giving evidence, said that the Corporation had not made any application for an increase in the maximum prices in connection with gas under the Temporary Act. The Corporation acquired the undertaking in 1875 from the St. Helens Gas Company, and paid £131,000 for it. The capital outlay up to March 31, 1920, was £417,322; this figure including the original outlay of £131,000. Of this sum, only £58,300 remained outstanding. Therefore, so far as the capital charge on the undertaking was concerned, they were in a very healthy position. The consumers supplied through coin meters numbered 17,194, and through ordinary meters 3204—making a total of 20 398. When the Corporation purchased the undertaking, the price of gas was 4s. 6d. within the borough and 5s outside. When the Act was passed which authorized the purchase, the maximum prices were 4s. and 4s. 6d.; and these prices were charged at the present time for ordinary consumers. For gas-engines, which were long-hour consumers, the prices were 3s. 6d. and 4s. There was no charge to ordinary consumers in respect of meters and stoves—this being all included in the price per 1000 c.ft. No discount was allowed at present; but in the past discounts were made, except in the case of gas sold for gas-engines. The accounts were rendered monthly, and a discount of 2½ p.ct. used to be allowed; but now all discounts had been wiped-out.

In answer to Mr. Edgar Horne (a Member of the Committee), witness said discounts were disallowed at the end of March, 1920.

Continuing his examination by Mr. Bailey, witness said that up to March 31, 1920, the amount to the credit of the revenue account was

£11,440. He estimated that although maximum prices were being charged, for the year ending March 31, 1921, after providing £4000 for meters and stoves, there would be a deficiency of £3000. The Corporation were entitled, under the Act of 1898 (section 100) to create a reserve fund up to £25,000. They had not, in fact, been able to create this reserve fund; but there was a working balance of £11,440, which stood to the credit of the revenue account. It was necessary to maintain this working balance to carry on the undertaking; but it was a very small amount for the purpose. The undertaking was faced with an increased capital outlay, the annual charges on which he estimated would be £7200 a year—*i.e.*, in respect of some £74,000 they were going to spend. He anticipated that unless they were able to increase the present maximum charges they would be on the wrong side at the end of the year, particularly inasmuch as the value of bye-products was reduced considerably. They had depended largely on the income from residual products; and they would require that the prices charged for gas be more nearly the amount required to meet the cost of producing it. For the year to March 31, 1921, the estimated income was £159,074, and the estimated expenditure £149,733, showing a gross profit of £9341. There was, however, interest on loans £2676, sinking fund £5656 (making a total of £8332); and the estimate for meters £2100, stoves £1900 (a total of £4000), added £12,332 to the expenditure—thus showing an estimated deficiency of £2991.

In answer to Mr. HORNE, witness said these figures were in respect of new meters and stoves, and not repairs. In addition to the figures given, meters and stoves had been maintained. There were standing on the books at the present time hundreds of requisitions for stoves which they had not been able to meet.

Continuing, witness said that an increase of a penny in the supply area would mean £2000 added income. The further capital expenditure needed immediately was £8230 for mains and £66,500 for retorts—making in all £74,730; and these were now in hand.

Mr. HORNE asked whether the undertaking had any water gas plant.

Witness said they had not directly; but they had a system of continuous vertical retorts in which water gas was now being produced in the process of gas manufacture. From a ton of coal in the continuous vertical retorts with steaming (producing water gas) 15,000 c.ft. of gas was obtained. Without the water gas, they obtained about 12,500 c.ft. from such coal as they were getting at the present time.

Continuing, witness said that if they added the £7200 a year for interest and sinking fund on the new capital expenditure, the estimated deficiency would be £10,000.

Mr. BAILEY said that the Board of Trade had accepted clause 51, subject to a condition.

The CHAIRMAN asked what were the grounds on which differentiating charges were made outside the borough as against inside.

Witness replied that these were the additional cost of mains and supervision. There had always been an arbitrary amount of 6d. per 1000 c.ft.

Mr. RHODES (Ministry of Health) said that this was fixed in 1869, and asked if the circumstances were still the same.

Witness said they were.

The Committee agreed to clause 51, with the following addition:

> Provided that within six months from the passing of this Act the Corporation shall apply to the Board of Trade for an Order under section 1 of the Gas Regulation Act, 1920, and the Board of Trade may, by such Order, authorize the Corporation to charge a maximum price per therm corresponding as nearly as may be to the maximum price authorized by this section without any addition in respect of increases in the costs of production and supply of gas which have occurred between June 30, 1914, and Dec. 17, 1920.

Clause 52, Mr. BAILEY explained, was the Model Clause for the purchase of residual products for purposes of conversion.

Witness, re-called, replying to Mr. HORNE as to the price of tar, said that they had been receiving up to £8 and £9 per ton. He was the assessor of tar values for many tar makers; and the price was now down to £4 and £5.

The Bill also includes the usual powers as to the mode of cutting-off supplies, obligations as to the supply of gas, and provisions for the occupier of premises to pay expenses of re-connecting discontinued supply. Clause 54 gives the Corporation power to vary the price of gas according to the purposes for which it is supplied, as may be agreed between the Corporation and the consumer, provided the Corporation shall not give any preferential price as between any consumers who shall take a supply of gas for the same purpose in like circumstances. There was a precedent for this in the Pontypridd case, said Counsel.

This part of the Bill, as amended, was passed by the Committee.

A Coke-Oven Gas Supply Shutting-Down.—Owing to the depression in the coke trade, the bye-product plant at the Manvers Main Colliery is being closed-down, and will shortly cease to supply gas to the adjoining districts of Mexborough, Swinton, Kilnhurst, Wath, Goldthorpe, Bolton, and Thurnscoe. The two lighting authorities in the area are preparing to utilize their own gas-making plant, which has been in disuse for many months; and steps are being taken to lay in stocks of coal.

Gas Finances at Halifax.—In announcing to the Halifax Town Council the estimates for the coming financial year, Alderman H. Clay, referring to the Gas Committee's expenditure of £57,000 on new retorts, &c. (of which £20,000 was paid off last year), said that, instead of debiting the whole balance of £37,000 to this year, it was suggested that it would be reasonable to ask the Committee to pay a moiety now and spread the sum over three years; and this suggestion has been accepted. A reduction on lighting had been effected by less need for full consumption of gas owing to improved burners. Alderman J. H. Waddington objected to the transference of £10,000 from the gas department's earnings to rate relief, which he said had removed the possibility of reducing the price of gas. He held that trading departments should give the advantage of their successful operations to consumers, and not exist to give relief to the ordinary ratepayers. The estimates were approved.

LEGAL INTELLIGENCE.

EAST HAM CORPORATION v. THE BOARD OF TRADE.

The Gas Light and Coke Company's Order.

In the Divisional Court of the High Court of Justice, on Tuesday of last week, before Justices DARLING, AVORY, and SALTER, the Board of Trade appeared to show cause why a writ of *mandamus* should not issue commanding them to hear and consider the objections and representations of the Corporation of the County Borough of East Ham, made with reference to an application by the Gas Light and Coke Company under the Gas Regulation Act, 1920.

The ATTORNEY-GENERAL (Sir Gordon Hewart, K.C.) and Mr. BRANSON appeared for the Board of Trade; Sir JOHN SIMON, K.C., Mr. INSKIP, K.C., and Mr. R. HARKER for the Gas Light and Coke Company, and Mr. MACMORRAN, K.C., and Mr. TURNER for the East Ham Corporation.

Mr. BRANSON showed cause against the rule. He said the ground for the rule was that the information given the Corporation was insufficient for them to formulate their case. On Nov. 11, 1920, the Gas Light and Coke Company made application to the Board of Trade for an Order under section 1 of the Gas Regulation Act, to enable them to charge a higher price for gas and to make the price so much per therm instead of so much per 1000 c.ft. It was said that, though the Company had strictly followed all the rules prescribed, this had not been sufficient to enable the Corporation to make their representations or objections to the Board of Trade in the way they desired to make them. The Gas Company gave all the information they could, and the Corporation asked for further information; and now the Corporation said that the Board of Trade neglected their duty to hear and determine the representations of the Corporation. The Company had complied with all the rules; but the Corporation thought they ought to have had further information from the Company; that the Board of Trade should have demanded further information, and supplied it to the Corporation; and also extended the time for the Corporation to make representations in the case against the Company that they wished to make. He submitted that the Board of Trade had given all the prescribed information, and that they gave the Corporation every opportunity for representation and to discuss the question with the Company before they adjudicated upon the matter. It was then the Corporation said that their application had not been heard. The sum and substance of the case was that the rules did not give the amount of information that the Corporation thought should be given.

Sir JOHN SIMON, without troubling the Court with any observations, read the following affidavit made by the Governor of the Gas Light and Coke Company:

I have read what purports to be a copy of the affidavit of Charles Eustace Wilson, sworn on Feb. 23, 1921, and what purports to be a copy of the affidavit of Arthur Valon, sworn on Feb. 24, 1921. The application of the Company to the Board of Trade for an Order under section 1 of the Gas Regulation Act, 1920, was made on Nov. 11, 1920. The Company, in making the said application, complied strictly with the rules made by the Board of Trade under the said Act.

A copy of the schedule required under the rules, and copies of all the other documents submitted therewith, were on the said date deposited at the Company's offices, No. 84, Horseferry Road, Westminster. On Nov. 11, 1920, notice of the said application was given by the Company to the East Ham Corporation. This notice informed the Corporation that a copy of the said application, and of all the documents submitted therewith, could be inspected, free of charge, at the Company's offices at any time during office hours.

The time within which representations had to be made expired on Dec. 6, 1920. The East Ham Corporation did not between Nov. 11, 1920, and Dec. 6, 1920, inspect the said application or documents, or ask the Company for any information about the application or the facts relating thereto.

I was present at the meeting held by the Board of Trade on Jan. 4, 1921, representing the Company. The following local authorities were represented: The Corporation of the City of London, the London County Council, Westminster City Council, the Wandsworth Borough Council, the Battersea Borough Council, the East Ham Corporation, the West Ham Corporation, and the Hendon Urban District Council. I was invited by Mr. Honey, the Director of Gas Administration, who presided, to make a statement with regard to the Company's application. I did so, and dealt with the various points which had been raised by the local authorities. At the close of my statement, the following gentlemen addressed the Director: Mr. H. H. Beadle, on behalf of the London County Council; Mr. S. G. Turner and Mr. Arthur Valon, on behalf of the East Ham Corporation; Mr. John Hunt, on behalf of the City of Westminster; and Mr. F. A. B. Lord, on behalf of the City of London. All of them criticized and discussed the Company's application and figures in detail, including Mr. Turner and Mr. Valon. Mr. Turner was the only one who suggested that the information supplied by the Company was not sufficient.

Mr. Turner addressed the Director upon the points raised in the affidavit of Charles Eustace Wilson, and while arguing as to (1) that the costs and charges as at June 30, 1914, should not have been determined by taking an average of the previous three years, stated that he did not wish to press the point in any way; as to (2), that the pre-war standard price should be calculated with reference to a calorific value of 540 B.Th.U., that he did not want to say anything more about these points as long as Mr. Honey was apprised of them.

With further reference to Mr. Wilson's affidavit, I desire to call attention to the letter from the Board of Trade to the Company dated Feb. 3, 1921, which letter shows that, after careful consideration of the application and of the representations made to them, they decided that the standard price should be 15·2d. per therm, instead of 15·6d. asked for by the Company. This letter also shows that the Board of Trade considered the points set out in the affidavit aforesaid.

Mr. Turner and Mr. Valon also addressed the Director on the following further points—as to what should be taken as the standard or calorific value of the gas supplied by the Company in 1914; the question of the extra amount to be charged to consumers using prepayment meters; the cost of coal; the profits from the sale of coke; and the cost of repairs and maintenance of works and plant. I replied on behalf of the Company to the criticisms of the above gentlemen.

At the conclusion of the proceedings, Mr. Turner, on behalf of the East Ham Corporation, asked for a formal inquiry to be held, and stated that he admitted it was within the discretion of the Board of Trade to do so or not. Mr. Honey asked those present whether anyone else wished to say anything on the suggestion of a further formal inquiry. The only person who supported the suggestion was Mr. Cranfield, on behalf of the West Ham Corporation.

Mr. Macmorran said the Corporation were large consumers, and the matter was a very serious one for them. The Gas Regulation Act, 1920, section 1, sub-section 3, provided that the therm should be the new unit based on calorific value, and the Company could apply for an increase of price to be on a prescribed form. The increase in this case was based on an estimate; and the Corporation were unable to extract from the form prescribed by the Board of Trade, and completed by the Gas Company, sufficient information to give the necessary details for the representation which they were entitled to make under the Act. For instance, the Board of Trade had not looked at the price of coal, and had not had a full inquiry. Many things were not discussed at the merely formal conference which took place.

Mr. Justice Darling, in giving judgment, said that the schedule complained of went beyond what was required by the Statute. The objection was in substance an objection to the prescribed form; but he found that all necessary details were given, and then estimates are given on which proposed increases were based. It was true that they were only estimates; but no one could give an accurate estimate of what the state of the coal trade would be in six months time. It was important to consider what the Corporation would have got if it had succeeded, and it could only get an estimate. Other equally important corporations objected to the schedule at the time; but they were now apparently satisfied. If the form had been obviously bad, no doubt a *mandamus* would have had to be issued; but that had not been shown. There was no reason why East Ham should have more information than Westminster or the City of London, or any other corporation.

Mr. Justice Avory and Mr. Justice Salter agreed.

The rule was discharged, with costs.

A Derbyshire Absorption Scheme.—It is announced that negotiations are now in progress for the absorption of the Alfreton Gas Company's undertaking by the Riddings Gas Company, and that certain terms which have been offered are under consideration. A similar scheme was introduced some years ago; but it fell through. During the war, and since the armistice, small gas companies have experienced many difficulties; and there is a strong feeling among the shareholders of the respective Companies that amalgamation is the best way of reducing the costs and producing light and power economically. The gas supplied by the Alfreton Company is now 6s. 6d. per 1000 c.ft.; and it is hoped that by the proposed fusion the service to the public will be materially cheapened.

Eckington and Mosborough Gas Company.—At the annual meeting of the Company, Mr. G. Stevenson (the Chairman) remarked that the amount standing to the credit of the profit and loss account for the year, including £417 brought forward, was £665; and he moved that a dividend be declared of 6 p.ct. (less tax) on the ordinary shares, and 4 p.ct. (less tax) on the additional shares, which would leave £145 to be carried forward. He said the Directors regretted that they did not feel justified in recommending dividends of 10 and 7 p.ct. respectively, as last year; but he was glad to say their prospects were now much brighter. The dividends were approved. A letter was received from Mr. A. E. Hall, resigning his position as Secretary of the Company, owing to ill-health, after 25 years' service; and a resolution of appreciation of his work was unanimously passed.

Gibbons (Dudley), Ltd.—In their twenty-sixth annual report, which relates to the year ended Dec. 31 last, the Directors state that the net profit, after providing for excess profits, corporation tax, and depreciation, is £29,274; and this added to the amount brought forward makes a total of £36,216. Of this, £7758 has been placed to reserve; and the payment of the full preference dividend, the interim dividend of 10 p.ct. on the ordinary shares, and the dividend of 7 p.ct. on the short-term capital, leaves £13,337 to be dealt with. The Directors recommend a dividend of 2½ p.ct., free of income-tax, on the ordinary capital, making a total of 12½ p.ct. for the year. They report, with deep regret, the death in November last of their esteemed colleague Mr. William Smith, who had been connected with the business for over fifty years, and a Director since the formation of the Company in 1895.

Cromer Gas Company.—Presenting the accounts for the year ended Dec. 31, the Directors reported that, in comparison with the previous year, the sales of gas show an increase of 1·5 p.ct., while the revenue from the sale of residual products is larger by £706. On the other hand, the cost of manufacturing gas—that is, of coal, carbonizing wages, repair and maintenance of works and plant, &c.—is £1588 more. To meet the serious additions to the cost of production and distribution, the price of gas has been advanced from time to time during the year to the extent of 1s. per 1000 c.ft. The current charge of 6s. 6d. compares favourably with those made in other towns and districts in Norfolk. The greater part of the present cost of gas is represented by the high rates of wages now being received by the Company's employees, and by the miners, railwaymen, and other workers. Unfortunately, a serious reduction of revenue is in process, owing to a sharp decline in the market value of residual products. The success of the Cromer "season" was adversely affected by the strike of the coal miners in the autumn. This led to a reduction in the number of visitors to the town and district; and as a consequence, the general outcome of the year's business is less satisfactory than otherwise would have been the case. After providing for interest, income-tax, and all other charges, there remains a balance of profit of £1041 available for division. The Directors accordingly recommend the declaration of a dividend for the year 1920 of 2 p.ct. (less income-tax). This is the maximum rate the Company are permitted to distribute, pursuant to the provisions of the Cromer Gas Act, in view of the price charged for gas. The dividend and the tax thereon will amount to £888, leaving a balance of £153 to be carried forward.

MISCELLANEOUS NEWS.

CONSOLIDATED GAS COMPANY OF NEW YORK.

Report for the Year 1920.

The Annual Meeting of this Company was held on Jan. 24, when the proprietors were presented with the customary exhaustive report. It shows that the combined gas sales of the Consolidated Gas Company and its allied Companies in the Boroughs of Manhattan, the Bronx and Queens, and in Westchester County amounted in 1920 to 37,876,872,000 c.ft.—an increase of 4,201,900,000 c.ft., or 12·48 p.ct. over 1919. The total number of gas-meters in use was 997,251, and of electric meters 462,061. Of 75,616 street lamps, 6987 were incandescent gas, 417 electric arc, and 68,212 electric incandescent.

In view of the present outlook and anxieties (we hope decreasing) of the industry in this country, it is thought the following extracts from the report may prove of interest to "Journal" readers.

Their View of the Candle and the B.Th.U.

From time to time during the year, public authorities within the State of New York have initiated inquiries as to the advisability of discontinuing a candle-power standard for gas and substituting therefor the British thermal unit standard. Engineers and executives of this Company have attended such hearings when summoned, and have placed at the disposal of the public authorities any experience or information desired by them in reaching a conclusion. The position of the Company has been, and is, that within the limits of operating possibility it will furnish, and does furnish, to its consumers gas of such standard of candle power or heating value as may be desired and directed by the public through its official representatives, and that the Company will in turn require the payment of a reasonable rate for gas of the quality thus prescribed. So long as 22-candle power gas is prescribed by Statute or Commission order, the Company will furnish this quality of gas and expect to be paid therefor a commensurate rate. The inquiries of the public authorities within the year have, however, established, in the opinion of the Company's executives, that the continued requirement of the 22-candle power standard results in the production of gas of no greater utility to the consumer than that which would conform to the standard of approximately 550 B.Th.U., but makes the necessary price of gas to the consumer, under the 1921 price for gas-oil, approximately 12·18 c. per 1000 c.ft. more than would be necessary under such thermal-unit standard. Furthermore, the large waste of oil resulting from the continuance of the candle-power standard no doubt has a bearing upon present oil prices.

The instrument used in the attempt to measure the candle power of gas is known as the "Bunsen Photometer," dating back to the year 1841. Where it has not been displaced by modern practice, it is, with some modifications in general arrangement, still in use. The results obtained from it in terms of the illuminating or candle power of gas are not now (nor were they ever) anything more than an approximation, as was demonstrated in the trial of the rate case in the Federal Court last year. Different results are obtained by the use of different burners; candles that burn properly are rarely obtained; the factor of personal error in observation, comparison, notation, and computation from logarithmic tables is ever present; and the results are both unreliable and inaccurate. As long ago as 1888, a Committee of the British Association, reporting on light standards, said that "the present standard candle is not worthy in the present state of science of being called a standard." When the candle is discarded and pentane or other lamps are substituted for it, the lamp must be standardized before use and frequently thereafter. Such standardization is effected by a comparison of the lamp with the candles that it displaces as being "unfit for direct use." It is, therefore, obvious that, as the candle-power test, under the present law, is the only means of determining the value of the gas to the consumer, it should be discarded as a standard of quality, and a reasonable B.Th.U. standard substituted for it. This has already been done in England, where the candle-power standard originated, and also in most of the States and Cities in this country. The thermal standard is endorsed by scientists as being the correct method of determining the value of gas to the consumer under present-day conditions of use. It is found that, where a reasonable B.Th.U. standard is established, gas of a more uniform and efficient quality is produced, valuable materials are conserved for other purposes and industries, and the consumer is served with greater efficiency and satisfaction than is possible under any arbitrary candle-power standard.

Shortage and Cost of Coal.

The ratio of increase in gas output early in 1920 did not continue throughout the year. In the spring and through the summer months, it was believed by some that the Companies would be called upon in the fall for an increased quantity of gas for heating purposes, principally because of the shortage of coal for domestic and industrial use. But towards the end of the year the coal shortage was partially relieved, which, combined with the fact that the last two months of the year proved unusually mild, resulted in an increase substantially less than was anticipated.

The state of the market for gas-making materials, principally bituminous and anthracite coal and gas-oil, has been a cause of anxiety throughout the year, because of the uncertainty as to supply and the prevalence of high prices. Company records show that on Jan. 1, 1919, we had in stock in Manhattan and the Bronx less gas-coal and less anthracite for water-gas manufacture than we usually aim to have at the beginning of the year. Through the years 1919 and 1920, our stock decreased, notwithstanding that every effort was made to obtain the delivery of coal contracted-for. In 1920, labour troubles at the mines and in water transportation in our own harbour, lack of cars and general railroad demoralization, all combined, brought about a condition in the fuel market never before experienced.

Just before the end of the first half of the year, we were confronted

with what seemed an almost insurmountable condition. Neither bituminous nor anthracite coals were coming in as rapidly as they were required for daily use; and with our coal-gas manufacture (and consequent coke production) cut to the lowest possible point consistent with maintaining our organization, we were obliged to go into our reserve stock of anthracite to keep up the supply of gas, and at the same time endeavour to hold a sufficient quantity of anthracite available for use in the winter months, in case there should be no improvement in the existing conditions, when we should be obliged to use anthracite to operate our water-gas plants to full capacity, which cannot be accomplished with coke fuel. About July 1, there was a slight increase in gas-coal delivery, and early in the month we had gained 9000 tons of gas-coal, and had on hand 49,000 tons of anthracite. With no assurance that this slight improvement would continue, we could not see our way immediately to increase the use of gas-coal until an assured supply could be obtained; but as we continued to receive increasing quantities during the months of July and August, it was thought safe, early in September, to increase its use. This gave an increased quantity of coke for use in the water-gas plants, though not enough appreciably to decrease the use of anthracite; and our stock continued to diminish until by the middle of September we had on hand 37,000 tons—a loss of 12,000 tons in slightly over two months. The anthracite mines again shut-down with labour troubles early in September, but we were able to maintain our stock; and in November deliveries began and the receipt of gas-coal continued to improve. In the latter part of September, we were able to see our way clear to increase still further the use of gas-coal, giving us an increased quantity of coke for use in the production of water gas. Failure on the part of the coal-dealers who were under contract to supply the Companies' requirements compelled us, in order to ensure our having in stock an adequate supply of coal to carry us through the period of maximum winter demand, to go into the open market and purchase a large quantity of gas-coal, for which we were obliged to pay prices substantially higher than those at which contracts had been made. In addition to this, purchases were made of Seaboard and Connellsville oven-coke, which began to be received in September, thus further enabling a conservation of anthracite. At the end of the third quarter of the year, we were in better condition for fuel than we had even hoped to be early in the year. During the last three months of the year, deliveries of both gas-coal and anthracite improved so that we had on hand, at the end of the year, 68,000 tons of gas-coal and 95,000 tons of anthracite; and the indications are now that a return to normal conditions, in respect of coal deliveries, may be expected in the near future.

The difficulty of obtaining an adequate supply of gas-coal and anthracite was attended by a very substantial increase in the cost per ton at the mines and in the cost of transportation to our manufacturing plants. The cost of rail transportation, insurance, lighterage, &c., has become more than the coal itself formerly cost delivered at our plants; and there would seem to be little likelihood that these costs, together with the increased cost of labour at the mines, will decline at any time at present capable of being forecast. Anthracite, for which before the war we used to pay $4.67 per long ton, f.o.b. our manufacturing plants, and which cost in the early part of 1920 $8.26 per ton, was increased during the last half of the year to in excess of $12.00 per long ton, f.o.b. our plants. Likewise bituminous coal, for which before the war we used to pay $3.30 per long ton, f.o.b. our manufacturing plants, and which cost in the early part of 1920 $6.00 per ton, was increased during the last half of the year 1920 from $11.00 to $14.00 per long ton, f.o.b. our plants.

THE OIL OUTLOOK.

No trouble was experienced in obtaining delivery of a sufficient quantity of gas-oil for our needs during the year; but the outlook for the future cannot be said to be reassuring—from the viewpoint of the consumers of a gas industry still required by law to operate under a 22-candle power standard, prescribed at a time when the supply of gas-oil was ample and the price one-fourth to one-third of the present figure. The increased use of the lighter products of petroleum (notably gasoline), and the constantly increasing effort of the producers to supply the demand, has resulted in the withdrawal from the market of a large portion of the oil best suited for gas production.

Tests and experiments have been made by engineers of the Company as to the possible use of lower grades of oil in gas manufacture; but there are as yet no conclusive developments as to either the practicability of its use (particularly under the candle-power standard), or its availability in adequate quantities. The high price of coal has created a demand for oil fuel. Many ships of the United States Navy and the Merchant Marine have been converted from coal to oil burning vessels. This further use of the heavy products of petroleum in the immediate future might be deemed to indicate that fuel oil may not be obtainable, if indeed its use is found practicable.

THE UTILIZATION DEPARTMENT.

The promotion of the use of gas for industrial purposes, and particularly the solution of the numerous problems presented by the adaptation of gas-appliances to the special requirements of various manufacturing undertakings, continued during the year to engage the attention of the engineering staff attached to the Utilization Department. The importance of these activities and the results obtained cannot be overestimated, since they greatly increase the all-the-year-round sale of gas. It is gratifying to note that, due largely to an increasing confidence in the dependability of gas as a fuel, industrial consumers are becoming more and more willing to spend adequate sums for suitable and efficient installations of industrial appliances.

An interesting tendency is found in the willingness of manufacturers to apply gas to the larger heating problems of their industries for which, until recently, gas was considered impracticable. Formerly, a single installation consuming one thousand c.ft. per hour was considered as being large. To-day, numerous installations consuming two thousand c.ft. per hour are demanded; and several requests for appliances consuming three thousand have been received. In the metal-melting industry, due to the methods of gas utilization developed by the Company, more than one-half of all the crucible furnaces in the city are gas-fired.

The demand for the special type of burner designed for large industrial installations is rapidly increasing. Numerous installations were made during the year; and because of its remarkable performances, it is being successfully applied to industries which previously used other fuels. An unusual application of this burner was made at a plant where one of a battery of coal-fired furnaces used for the conversion of starch to dextrose products was re-designed experimentally for the use of gas as fuel. The result proved so satisfactory that all the furnaces in a new building now being equipped will be gas-fired—thus opening up a new field of utilization.

The Company has developed an appliance which has made it possible to use gas for heating water in the large quantities required for loft and office buildings, apartment houses, and institutions. This also is a new use for gas and a most attractive business for the Company to obtain, as it creates an increased demand for gas during the summer months. Several installations have been made requiring as much as 140,000 c.ft. per week.

OTHER ACTIVITIES.

A special domestic gas-iron campaign was conducted during the months of May and June, 1920, resulting in the installation during that period of 13,322 domestic gas-irons.

A semi-indirect lighting fixture campaign was conducted during the months of October, November, and December, 1920, resulting in the sale of 13,441 semi-indirect lighting units.

Our Emergency Service during the past year has continued to function successfully. The despatching of the emergency cars is under the control of trained men, who are on duty at the main office at all hours of the day and night, and who receive all calls for its service. They send the nearest available car to the scene of the complaint, and at all times keep in direct touch with the cars and crews.

The policy, referred to in previous reports, of providing suitable educational facilities for employees, including meetings, lectures, optional and compulsory class work, and individual and group training in technical departmental work, was continued during the year.

METROPOLITAN GAS COMPANY OF MELBOURNE.

Increase of Capital—The Gas-Workers' Strike.

The Ordinary General Meeting of the Company was held on Jan. 28—Sir JOHN GRICE presiding.

The CHAIRMAN, giving a short résumé of the year 1920, said that during the twelve months ended Dec. 31 last, 3,111,000,000 c.ft. of gas were sold, compared with 3,395,000,000 c.ft. during 1919—a decrease of 284,000,000 c.ft., or 8·34 p.ct. This unsatisfactory result of the year's operations was the direct consequence of the very disturbed industrial conditions which prevailed, as during the year the business of the Company was partially suspended on three separate occasions by strikes. The first was during the marine engineers' strike in the early part of the year, when restrictions were placed on the use of gas for a period of five weeks; the second during the gas-workers' strike of nearly seven weeks, when the output of gas was reduced as low as one-third of the normal—this was the second gas-workers' strike in seven months; and the third, the present restrictions, caused by the stewards' strike, which commenced on Dec. 26, and still continued. For a full quarter of the year the use of gas was under some restriction; and, apart from the loss of revenue during their operation, a recovery from such periods was always a slow process. The Chairman then quoted from a tabular statement to show the effect of these continual dislocations of industry caused by labour unrest. He here remarked that it would be noted that strikes had affected the Company more during the past year than in any previous one, and that the sales of gas in 1920 were, as a consequence, the lowest experienced since 1915. Notwithstanding the present strike having been in existence for a period of about six weeks, the Company were able to get sufficient coal to carry on, though deliveries were uncertain. The effect of the present restrictions was to reduce the output of gas by about 25 p.ct., which involved a loss of business to that extent. When it was borne in mind that, excepting by the purchase of a smaller quantity of coal, the expenditure could be only infinitesimally reduced, it would be seen how costly any strikes affecting the shipping industry were to the Company, and that during their continuance the operations of the Company were carried on at a heavy loss. A further increase in the price paid by the Company for its coal supplies had taken place during the period under review; 4s. per ton having been added from Sept. 27 last. During the last two years, the cost of coal had increased by 9s. 8d. per ton, equal to 43 p.ct.; and compared with pre-war conditions in 1913 it had increased by 18s. 2d. per ton, equal to 106 p.ct. On the settlement of the strike in July last, an agreement was made with the Federated Gas Employees' Industrial Union, under which the Union was to submit its case to the Arbitration Court at the earliest opportunity. The Company undertook in the meanwhile to adjust the wages of its employees every three months; such adjustment being based upon the published cost of living figures of the Commonwealth Government Statistician for the previous twelve months. To meet the heavy increase in wages and the cost of coal, the Directors found it necessary from time to time to increase the price of gas; and, from a perusal of the balance-sheet, which not only showed that no provision for reserve fund, gas-stoves, or meter renewal had been made, but that there had been an actual loss of £25,000 on the half-year's working after the dividend had been paid, it would be seen that it would be quite impossible for the Company to meet this further additional expense without a reconsideration of the present price of gas. As indicated in the report, the Directors were able, with some satisfaction, to advise that an extension of the Company's capital powers had been obtained, without which an adequate gas supply to the public of Melbourne would have been impossible. Indeed, it might be mentioned that, prior to the amending Act being passed, applications for new mains amounting in all to some 600 would-be customers, had had to be declined. The total amount of share capital which the Act originally permitted the Company to raise was £1,000,000. By the amending Act passed, this sum had been increased to £1,500,000. A similar increase automatically followed in respect of debenture capital, of which a further

£500,000 could now be obtained. In addition, the Company could borrow on debenture a sum equal to the amount standing to the credit in the capital account of premium capital. At the present time, this amount was £584,210, so that the capital powers of the Company in shares and debentures had been enlarged to the extent of £1,584,210. Proportionately to the present capital, this might seem a large sum; but the shareholders must bear in mind not only that approximately £500,000 of it was required to repay present liabilities, but that the remaining £1,000,000 was only able at present to do 40 p.ct. of what it would have done in 1914. A further provision in the new Act was the one relating to the debentures of the Company, which had been placed on precisely the same footing as a trust security as Government debentures and municipal securities. Prior to the passing of the amending Act, trustees could only invest moneys in their care in the Company's debentures when the deed under which they acted did not expressly forbid such investment, or when no other method of investment was prescribed. This alteration of the law in respect of the debentures would be of material advantage to the Company and to trustees. In view of the fact that approximately £500,000 would be required to adjust the Company's finances, the extra million of share and debenture capital which had been provided for in the new Act would not, even when obtainable, go very far, and was not so great a sum as the Company requested the Government to grant. But it should be sufficient to meet the ordinary normal capital requirements for a few years. It must, however, be clearly understood that the amount of new capital was not sufficient to permit the Company undertaking the laying-out of a new works site. The Directors therefore would be compelled to overcrowd the West Melbourne works in a manner that, under the advice of the technical staff, they under normal conditions would prefer not to do. When the enormous cost of laying-out and building new works and connections therewith was considered, the expense must be postponed; and the Directors must do as best they could on the present area.

In conclusion, the Chairman moved the adoption of the report and balance-sheet.

Gas Engineers as Directors.

The motion having been seconded,

Mr. P. C. Holmes Hunt referred to the paragraph in the report relating to the appointment of Directors. Prefacing his observations with a reference to Sir John Higgins, he said that gentleman was one of his opponents that day; but he felt it only right to say that he appreciated along with the majority, if not the whole, of the community the great efforts of Sir John and the great work he had been doing in the national interest during the past few years. He wanted to explain that he was about to enter upon the most difficult task he had ever undertaken in his life, because he was bound to refer to personal matters. He would not refer to them if he could possibly avoid it. In the first place, he wanted to explain to the meeting the reasons which led him to nominate against the retiring Directors for a seat on the Board. He wished to make it quite clear that there was nothing new in a gas engineer becoming a member of a gas directorate. There were plenty of precedents in England. It was quite a common practice in America; and it was not unknown in Australia. The four big companies that supplied the metropolis of London to-day had on each of their Boards of Directors a trained gas engineer. Two of them at least had chairmen who had spent their lives in the industry. His opinion was that if a gas engineer (a specialist in gas manufacture) with administrative experience and suitable qualities was available, such a man was desirable on the Board of a gas company. Now as to his own qualifications for suggesting this to the Metropolitan Gas Company proprietors. The Company was face to face with a very large expenditure of the shareholders' money within the next few years. No member of the Board would claim that he had any experience respecting the modernizing and extension of gas plant. He had. He had had considerable experience not only in their undertaking for a period of ten years, but also in a much larger undertaking in Australia, and in connection with extensions of greater magnitude than those which this Company had as yet contemplated. He ventured to say that his experience would be of considerable help to the shareholders in the concern. The Company also had to face before long a considerable amendment of its Act of Parliament by the State Government. No one on the Board would claim possession of first-hand experience of the technicalities of gas legislation such as had been passed, dealt with, and handled in the other States of Australia, and along which lines legislation must come in Victoria. He had been right through the mill. He had this first-hand experience. The experience had been of immense benefit to him professionally; and he said unhesitatingly he believed it would be a great benefit to the Company. In addition, his experience in industrial troubles was considerable. Many of the shareholders knew he had had extensive experience of such matters, and of Arbitration Court proceedings. He appeared twice in the Arbitration Court in the Company's interests—once as an officer of the Company, and once at the special request of the Directors after he had left the Company's service. In 1919, he appeared before the Arbitration Court in a protracted hearing on behalf practically of the whole gas industry of Australia excepting this Company, which he was glad to say appointed its own industrial officer. He appeared for the other companies situated in the various States—all the Sydney companies, also the South Australian companies, the Tasmanian companies, and various other small concerns. These were the credentials of which he was forced to speak. He was sorry that he had had to refer to them. Now he wanted to allude to the manifesto issued by the retiring Directors. He proceeded to repudiate the idea that appeared to be running in the minds of some of those interested in the matter—that he was being put forward as the representative of the Share Purchase Association, or of the employees, or of any section of the shareholders. If he joined the Board, it would be with an endeavour to do his utmost for the shareholders as a whole. There was no misunderstanding the position. It was a decision which he did not form quickly. It was very carefully thought-out. These were the simple facts; and he submitted that his action was not deserving of the comments in, and the inference to be drawn from, the circular issued by the retiring Directors. He said it was a grossly misleading statement and absolutely unfair. Proceeding to refer to the work of the retiring Directors during the period under review in the settlement of the strikes, he said there was no reference in the Directors' document to any assistance that he gave in that grave situation. But there was no hesitancy on the part of the Directors to act in the closest co-operation with him before deciding as to the best course to be taken in the interests of the shareholders. Nor, so far as he was aware, was his acting in this capacity a matter on which the Board consulted the engineer. The retiring Directors were well aware of the part that he took in the conference both in those offices and with the head of the Government and the Chairman of the Coal Board. He challenged the retiring Directors to prove that any of them did more than he did in handling the strike difficulties in the interests of the shareholders and proprietors of the Company. The retiring Directors stood before the shareholders that day representing a threatened "striker" to whose dictation the Board were ready to bow; and the shareholders apparently must also refrain from exercising their judgment in regard to the election of the Board, as otherwise it must mean that gentleman's resignation. They had had several strikes, but this was the first occasion on which an executive officer had threatened to "down tools" if the Directors exercised—what?—the responsibilities placed upon them by the shareholders. This was surely something very new in Company administration; and as a member of the Company he said it was the worst possible development in any system of management. What sort of example was set to the officers and employees in the lower rank? He denied the right of any officer to have any say whatever with the Directors respecting the constitution of the Board. The only persons the Board had any right to consult on such a matter were the shareholders themselves. Now he came to his point. The Board's justification for their action regarding the filling of the extraordinary vacancy was the reason which determined his nomination, because he thought the shareholders should have an opportunity of discussing the position prior to being asked to vote by proxy. He had endeavoured as far as possible to keep-out personal references. His objection was solely to this obnoxious principle introduced by the Directors into the management. But he was going to say one word from a professional standpoint, and that was that no professional man ought to object to the appointment to his directorate of another professional man fully qualified. He also asserted that the appointment of the engineer's predecessor or of any qualified gas engineer on the Board of the Company should not be considered a slight upon the present holder of the position. Just one word respecting the election. He confessed that during the fight of the last week he had learned a lot; but he had found to his astonishment that the case had not been dealt with on its merits. Many of the shareholders he knew had given proxies without understanding the reason for his (Mr. Hunt's) candidature. He had received a great many communications expressing regret that the shareholders did not know the full particulars before sending in their proxies—otherwise undoubtedly they would have gone in his favour.

[The circular referred to by Mr. Hunt in his speech as having been issued by the three retiring Directors contained, among much else, the following paragraph:

"We, the Directors now standing for re-election, are opposed on this occasion by Mr. P. C. Holmes Hunt, who occupied the position of Engineer to this Company prior to the appointment of Mr. J. N. Reeson. Mr. Hunt was, we believe, approached with a view to his offering his services, and is strongly supported by the Metropolitan Gas Company's Share Purchase Association, consisting of employees of the Company, which body holds only some 1450, or less than 1 p.ct., of the total number of 200,000 shares issued by the Company. This Association requested in writing the Directors to give favourable consideration to the appointment of Mr. Holmes Hunt to fill the vacancy on the Board created by the death of Mr. John Watson. As the Association had helped the Directors to obtain the Amending Act, for which a resolution thanking it had been passed, the request was given exceptional consideration. The Directors, however, learnt from Mr. Reeson (who, prior to his present appointment, was Manager of Beckton, the largest gas-works in England) that the appointment of his immediate predecessor as a Director would not only be strongly against his wishes, but that as he felt such a selection would be regarded among engineers, and particularly those specializing in gas manufacture, as a slight upon him professionally, it must mean his resignation of the office which he has filled for the past seven years to the great satisfaction of the Board, and to the advantage of the Company. As this was too serious to be contemplated, the Board at once decided that it was not expedient, in the interests of the shareholders, to give effect to the request of the Share Purchase Association; and Mr. John S. Weir, who has been intimately associated with the gas industry for many years, and who is a large shareholder in the Company, was elected to the vacancy."]

There was a brief discussion, and the report was adopted.

At the conclusion of the meeting a ballot was taken respecting the election of the three Directors. The three retiring Directors, Sir John Grice, Sir John Higgins, and Mr. F. H. Wilson, offered themselves for re-election. Mr. P. C. Holmes Hunt was also nominated. The poll resulted as follows: Sir John Grice 2653 votes; Sir John Higgins 2632 votes; Mr. F. H. Wilson 2633 votes; Mr. P. C. Holmes Hunt 763 votes. The retiring Directors were then declared re-elected.

Carbonizing Capacity at Llandudno.—It was reported at the last meeting of the Llandudno Urban District Council by Mr. J. C. Belton (the Consulting Engineer) that the works for the extension of the gas undertaking already in hand were making satisfactory progress. In a report upon the carbonizing plant, Mr. Belton stated that in two years' time at latest the Council would be faced with the problem of keeping up the supply of gas for a demand considerably in excess of the present needs, with a plant incapable of maintaining it without renewals, which could not be carried out except by largely reducing the output of gas during the operation. It was necessary to place contracts for additional plant before next Midsummer, if Llandudno was not to be troubled with a deficiency of gas supply in the season of 1923. He recommended the erection of a new retort-house, and that there be installed in it vertical retorts for the production of 500,000 c.ft. per diem. The cost he estimated at £45,000. It was pointed out that further capital expenditure would also be necessary for the laying of larger mains.

GAS REGULATION ACT APPLICATIONS.

The following further notices have appeared in the "London Gazette" of applications to the Board of Trade by gas undertakings for Orders under the Gas Regulation Act.

Exmouth Gas Company.

The standard price now authorized in respect of the supply of gas by the undertakers is 5s. per 1000 c.ft.; and the rates of meter-hire are from 3s. per annum upwards. The price which the undertakers have asked the Board of Trade to substitute for this is 1s. 8d. per therm, with an increase of 50 p.ct. in the rates of meter-hire.

Huntingdon and Godmanchester Gas and Coke Company, Ltd.

The standard prices now authorized in respect of the supply of gas by the undertakers are: (*a*) 4s. 7d. per 1000 c.ft. to private consumers by meter of less than 170,000 c.ft. per annum; and (*b*) 4s. 2d. per 1000 c.ft. to private consumers by meter of 170,000 c.ft. or more per annum. The prices which they have asked the Board of Trade to substitute for these are: (*a*) 1s. 6d. per therm to private consumers by meter of less than 170,000 c.ft. per annum; and (*b*) 1s. 5d. per therm to private consumers by meter of 170,000 c.ft. or more per annum.

BIRMINGHAM MUNICIPAL ACCOUNTS.

Mr. Arthur Collins, the City Treasurer, has forwarded a copy of the Birmingham Financial Statement for the year ended March 31, 1920, which shows that the total revenue of the Corporation during the year under review was £10,182,483; the expenditure, £10,472,763. These figures, of course, include the trading accounts of the Corporation. The receipts on account of the borough fund were £4,031,880, and the expenditure out of the fund £4,295,132. The rateable value of the city at March, 1920, was £5,167,350. Glancing at the figures relating to the gas undertaking, it is seen that the revenue account showed a balance of income in excess of expenditure for 1919-20 of £178,848, which was carried to the profit and loss account. After providing for annuities, interest, and redemption of debt, this account exhibited a profit of £21,329, which was transferred to the reserve fund. The amount of capital expended during the year was £175,796. At March, 1920, the total expenditure on capital account was £2,993,028, and the gross amount of loans negotiated (including annuities) was £3,008,949. There was standing to the credit of the reserve fund £97,165. In the year under notice there was a sum provided from revenue for redemption of debt of £62 660; the gross amount so provided to the end of 1919-20 being £1,488,239. The balance of loans remaining to be provided for was £1,520,711.

PRESENT POSITION OF PUBLIC LIGHTING IN THE CITY OF LONDON.

Visit of a Glasgow Corporation Deputation.

Earlier this month a deputation of the Glasgow Corporation Lighting Committee arrived in London on a visit of inspection of the public lighting—more especially in connection with the development of the gas-filled electric lamp.

Last Wednesday week, the 16th inst., the deputation (consisting of Bailie James Stewart, Convener of the Lighting Committee, Bailie John Mitchell, the Vice-Convener, Mr. Robert Richmond, of the Town Clerk's Department, and Mr. S B. Landlands, the Public Lighting Inspector of Glasgow) were received by a deputation of the Streets Committee of the Corporation of the City of London, and entertained at dinner at the Great Eastern Hotel. Mr. Charles Newell (Chairman of the Committee) presided. Among those invited to meet the visitors were Mr. F. W. Goodenough (Gas Light and Coke Company), Mr. Frank Bailey (City of London Electric Lighting Company), Mr. E. E. Finch (City Engineer), and Mr. W. J. Liberty (Inspector of Public Lighting).

After dinner, the "Loyal Toast" having been honoured, the Chairman gave "The Visitors," and said what pleasure it afforded him to welcome the representatives of the City of Glasgow to the City of London. It was proposed to view the lighting of the City, and witness one or two demonstrations in connection with the central suspension lighting, and also to see upon London Bridge a new system of low-pressure lamps with clusters of inverted burners. It might interest the deputation if he gave some particulars of the lighting. The lighting of the principal thoroughfares in the City is by a mixed system of flame arc lamps, "Oliver" type, fitted with the "Peard" dioptric lens, and high-pressure gas "Keith" lamps, principally of 2000 c.p., centrally suspended across the main thoroughfares, at the intersection of the side streets wherever possible. There are a few 3000 c.p. lamps in the central parts of the City. Queen Victoria Street (from the Mansion House to Blackfriars Bridge) is lighted with high-pressure gas-lamps on posts, owing to the large number of refuges in the centre of the thoroughfare. There are some 430 arc lamps and about 100 high-pressure gas-lamps in the principal thoroughfares. The minor streets are lighted chiefly by incandescent gas-lamps on brackets fitted with inverted mantles and shadowless globes, giving an illumination of about 90 candles. There are also about 150 metallic filament electric lamps in a few of the side streets, and on refuges in the main roads. By extinguishing half the arc lamps at midnight when the traffic ceases, a saving is effected of £1280 per annum in respect of unconsumed current. By the adoption of the centrally-suspended system of lighting, and the more economical type of lamp (both gas and electric), the Corporation have been enabled to effect an annual saving of £6830, and to increase the illumination of the thoroughfares by some 600,000 candles, or about 100 p.ct. It has, up to the present, not been considered wise to remove any of the new economical flame arc lamps in the City in favour of the gas-filled electric lamp. Some of these lamps can, however, be seen in the thoroughfares of the neighbouring authorities, where they have replaced some very expensive and old-fashioned open-type arc lamps that had been up for some years, and had still a long period to run. In Upper Street, from the Angel to Nags Head, 500-watt lamps, with special clusters of three lamps on refuges, have replaced arc lamps. In Oxford Street, from Tottenham Court Road to Bayswater, gas-filled electric "M.F." lamps have taken the place of the twin-flame arcs down the centre of the roadway. There are specimens of multiple burner (low-pressure) gas-lamps with superheaters centrally suspended in Golden Lane. Each lantern contains 16 burners. London Bridge has just been installed with these multiple-burner lamps. They have two clusters of five burners in each lantern, and have taken the place of high-pressure gas-lamps. Since the armistice, the illumination of the high-pressure gas-lamps has been reduced by removing one burner from each of the lamps where they are not on refuges or at the junction of important thoroughfares—an allowance being made by the gas company for the unconsumed gas. The streets to be viewed were: New and Old Broad Streets, 2000 c.p. centrally suspended arcs; Royal Exchange area, 3000 c.p. arcs on posts; Poultry and Cheapside, 3000 c.p. centrally suspended arcs; Cannon Street, Keith 1000 c.p. centrally suspended high-pressure gas-lamps; Queen Victoria Street, Keith 1000 c.p. gas-lamps on posts; New Bridge Street and Fleet Street to Temple Bar, high-pressure gas-lamps centrally hung and on posts; and London Bridge, clusters of low-pressure, multiple burners, with superheaters.

Mr. Bailie Stewart responded, and, after thanking Mr. Newell for his kind reception of himself and his colleagues, said they had come to learn something of up-to-date methods of public lighting and new lamps. Mr. G. Gordon Stanham, of the Streets Committee (who formed one of the deputation to the Continent in 1909, in connection with public lighting), Mr. Goodenough, Mr. Bailey, and Mr. Langlands also spoke, on the Chairman's invitation.

METER-HIRE PROFITEERING CHARGE AT LYDNEY.

A Meeting of the Lydney Profiteering Committee was held on Tuesday of last week to consider complaints from four gas consumers concerning an increased charge of 50 p.ct. for the hire of ordinary meters, and of the making of a new charge for rent of penny-in-the-slot meters amounting to 5s. per annum. The Chairman of the Committee (Mr. H. W. Berthon), a local solicitor, conducted the proceedings, in which much interest was taken.

Mr. JOHN MOXON, solicitor, of Newport, represented the Directors of the Company, and very quickly disposed of the twopenny-in-the-slot meter cases, by proving that notices of the intention of the Company to charge in future for the hire of meters were served upon the complainants in October last. It was not until they were called upon to pay the new rentals in March, that the consumers complained to the Profiteering Committee; and Mr. Moxon put them out of court by pointing out that the transaction took place in October, when the charge was made, and not in March, when the amount due for the hire was collected. Notice was not, therefore, given to the Clerk of the Profiteering Committee within four days, as required by the Act.

The Committee agreed that this objection was fatal.

As to the cases lost by two hirers of ordinary meters, however, the Company took no preliminary objection of this kind, preferring to deal with them on their merits. The facts were admitted; the hire of a three-light meter having been raised from 1s. to 1s. 6d. per quarter.

Mr. MOXON said the Lydney Gas Company had been established since 1862, and until the war were for the greater part of the time able to trade at a profit. When the war broke out, the Company were in affluent circumstances; and this affluence, and the profit they formerly earned, had now disappeared. He proceeded to analyze the balance-sheet for the last complete year before the war (ending December, 1913) with that for the year ended December last, and then gave the following comparative figures:

	1913.		1920.
Coal	£1048	..	£3072
Repairs	424	..	523
Wages	292	..	1072
Profit	457	..	..
Loss	..	..	688

Thus a profit before the war had been turned into a heavy loss, in addition to which he explained that in 1913 the Directors were paid fees out of revenue; and in 1920 they returned the money due to them for their services. In 1913 a dividend equivalent to practically 5 p.ct. was paid, for which purpose £300 was required. It must, therefore, be perfectly obvious, not only to the complainants, but to all consumers, that the Company, so far from having profiteered, could not go on if such losses continued; and although there had been serious increases in the price of gas, it was only a reduction in coal and wages that could prevent further increases. The price of gas in 1914 was 4s. 2d. per 1000 c.ft.; and this produced £2321. In 1920 it was 8s. 9d.; and the revenue was £3508. The consumption had, in consequence of the increase in price, fallen off to the extent of 2 million c.ft. Their difficulties were not confined to the gas. The average life of a meter was fifteen years. The complainants had meters which, judging from the time they had had them, were in the evening of their days. There were fifty in the town in urgent need of renewal; but it was a question of ways and means, for meters were expensive things now. In 1914 a three-light meter cost £1 5s. 3d. It cost then £2 5s. 3d. to instal. In the course of fifteen years each meter of the complainants had brought in by way of rental about £3. If the Company had to replace them, each new meter would now cost £3 5s. 9d., and the installation would cost over £5. So far from the charges made by the Company yielding an unreasonable profit, there was an unreasonable loss; and the only hope that these prices for the Company's services could be maintained depended on the price of labour and coal coming down. It was well that the public should know that the penny-in-the-slot consumers were not placed at a disadvantage compared with the

ordinary consumers. Indeed, at the moment they had a slight pull over the ordinary quarterly contract consumer, who paid 8s. 9d. per 1000 c.ft. The slot consumer obtained 10 c.ft. for 1d., which was equal to 8s. 4d. per 1000 c.ft. A fair average consumption with the slot-meter was 3000 c.ft. per quarter. Thus he would pay £5 per annum for his gas, and under the new arrangement 5s. for his meter. The ordinary consumer also paid £5 5s.; but he had his meter-rent to pay in addition.

Mr. POWELL pointed out that the ordinary consumer was allowed a discount of 5 p.ct. for prompt settlement; and it was agreed that, if this was taken advantage of, the two classes of consumer were upon an equality as to terms.

Mr. MOXON added that, in consequence of the attitude adopted by the penny-in-the-slot consumers (some of whom had refused to pay and had been deprived of light in consequence), the present system was going to be discontinued as quickly as possible. There would be no further rental charges for meters; but the quantity of gas allowed for 1d. would be further reduced.

Mr. *T. A. H. Smith* (Secretary) and Mr. *S. R. Williams* (Manager) gave evidence in support of the statements Mr. Moxon had made. It was mentioned that there were 340 prepayment consumers; and if everybody paid the new charge for rent of meter, the revenue would be increased by £116, which was about one-fifth of the loss last year.

Mr. MORGAN (one of the complainants): "I am much more satisfied now that I have heard what has been said."

The CHAIRMAN, after briefly consulting with his colleagues, said they were satisfied that there had been no profiteering in this instance; and the complaints would be dismissed.

The "Lydney Observer," commenting on the case, thinks the decision goes to show that the smaller gas companies, who keep their affairs rigidly secret, never disclosing their annual balance-sheet, have a great deal to gain by taking the public further into their confidence. They enjoy a monopoly of a public service, and have nothing to lose by keeping the public well posted as to their difficulties. The Lydney Profiteering Committee would never have met if the public had known one single fact disclosed at the hearing—that the Company in 1920 traded at a heavy loss.

Exeter and the Therm Basis of Charge.—Notice has been given to the Exeter City Council by the Gas Company of an application they intend to make to the Board of Trade to repeal enactments requiring gas to be supplied of a particular calorific value, and to substitute power to charge per thermal units. The matter came before the City Council last week, when Mr. Hill said the Lighting Committee had had it under consideration; and, in view of the fact that the charges suggested were considered by the Committee more than they ought to be, they recommended the Council to authorize the Committee to make representations to the Board of Trade with reference to the application. The motion was carried.

BACK-DATING ELECTRICITY CHARGES.

Counsel's Adverse Opinion.

Reference has on more than one occasion recently been made in the "Electricity Supply Memoranda" to an agitation at Kingston-upon-Thames resulting from an attempt on the part of the Corporation, in addition to raising the price of current from 8d. to 1s. per unit, to make the higher charge retrospective to Sept. 30 last; and there seems no doubt now that the idea of back-dating consumers' accounts will be abandoned.

The minutes of the Lighting Committee which were presented at last week's meeting of the Town Council stated that the Committee had had correspondence with the Ministry of Transport on the question, and had authorized the Town Clerk to take Counsel's opinion on points raised by the objectors. Accordingly, Mr. A. M. Latter, Barrister-at-Law, was consulted; and his opinion, which was read at the meeting, was that there was quite sufficient doubt as to the points involved to make it wise for the Corporation, in the circumstances, not to insist on enforcing the Order as from Sept. 30, 1920; and if the opposition would be allayed by putting the Order in force only as from the starting of the new year, he was of opinion that the Corporation would be fully justified in adopting this course, and that it would be in the interest of all parties concerned if the Order were peaceably accepted as operating from that date.

Mr. WATERS drew attention to the "absurd position" in which the Corporation had been placed by the issue of the demand notes, and by the fact that, though the Lighting Committee had ordered the back-dating on the public lighting account, the Finance Committee had refused to sanction it. He hoped the muddle would promptly be adjusted.

Mr. SMITH said that, of course, those who had already paid the extra charge, so far as the period in dispute was concerned, would be credited with the amount in their next accounts.

Mr. CHENEY said the attitude he had taken in regard to this question was entirely upon legal advice, and in the interests of the ratepayers; but he readily accepted the ruling of Counsel. He added that he would be still more determined than ever to make the electric lighting undertaking a financial success.

The Council agreed to refer the whole matter back to the Lighting Committee; it being understood that the attempt to back-date accounts is now abandoned.

Shipley Gas-Works Deficit.—The Shipley Finance Committee's recommended general district rate of 8s. 6d. in the pound for the coming year, which is a reduction of 6d. in the pound, is intended to provide a sum of £2000 in reduction of the deficit on the gas-works account.

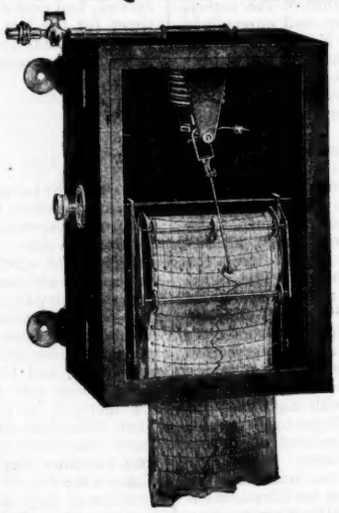
SIMMANCE'S DEAD BEAT RECORDER

TAPE CHART PATTERN

For Pressure or Vacuum.

NO LIQUIDS USED.

The chart roll is renewed 6 times a year.



The record can be torn off at any interval.

Lowest Range: 0-2 inches water.

Highest Range: 0-300 lbs. per sq. inch.

Suitable for Gas, Air, Water, or Steam, and may be used on Crude Gas.

MAKERS:

ALEXANDER WRIGHT & Co., Ltd., WESTMINSTER

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *March* 29.

There is nothing of interest to report in the London tar products market; the recent inactivity being still maintained.

Sulphate of ammonia continues to be steadily delivered to the home farmers.

Tar Products in the Provinces.

March 29.

The average values for gas-works products during the week were: Benzole 90 p.ct. North, 2s. 10d. to 3s.; crude 65 p.ct. at 120° C., 2s. 3d. to 2s. 5d. naked at makers' works; 50-90 p.ct. naked, North, 2s. 11d. to 3s. 1d. Toluol, naked, North, 3s. to 3s. 1½d. nominal. Coal tar crude naphtha in bulk, North, 1s. to 1s. 0½d. Solvent naphtha, naked, North, 2s. 5d. to 2s. 6d. Heavy naphtha, North, 2s. 9d. to 3s. Creosote, in bulk, North, liquid, 9d. to 9½d.; salty, 8¾d. to 9d. Heavy oils, in bulk, North, 10½d. to 11½d. Carbolic acid, 60 p.ct., 1s. 8d. to 1s. 10d. Naphthalene, £20 to £30; salts, £7 to £9, bags included. Anthracene, "A" quality, 10d. to 1s. per minimum 40 p.ct.; "B" quality, nominal.

FROM A MARKET CORRESPONDENT.

Tar Products.

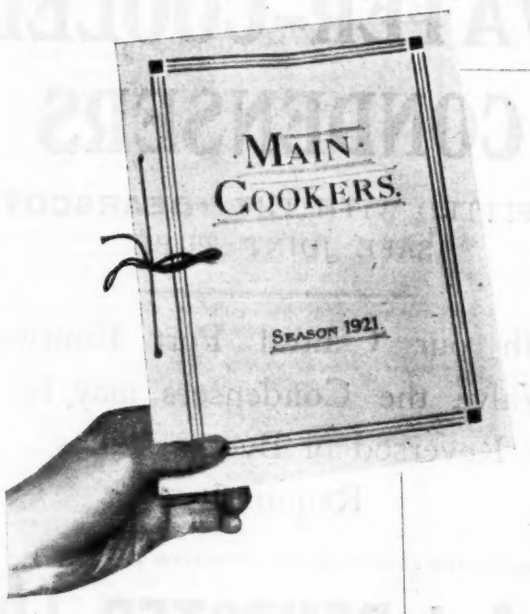
This market remains in a most disorganized condition, and it is difficult to know what is going to happen. Outputs have been enormously reduced during the past three months, and there is still no profitable market for the goods which are now being produced. It is still quite impossible to give any idea with regard to prices. Pitch is reported selling as low as 70s. per ton. In other quarters, 90s. per ton is mentioned; and with these figures about there are many who are trying to get rid of their obligations by paying large sums to cancel contracts. At present values it no longer pays to distil tar unless paying prices can be obtained for other products. This is certainly not the case with carbolic acid, as anything less than 2s. for crude leaves a loss. The only thing to-day seems to be to reduce the costs of production—no easy matter. The depression in the rubber trade has caused the demand for solvent naphtha to fall away, and a bid of 2s. 4d. per gallon would produce any quantity. Naphthalenes are on the easy side, and crudes are not now much required, so far as the firelighter trade is concerned. There is little demand for refined, which is nominally £25 per ton. Benzoles maintain their prices, as the quantity available is small. At the same time there is plenty of petrol about; and so long as this is the case, there is no likelihood for higher prices for benzole—at any rate, when used as a motor spirit. Again it is impossible to give a complete list of quotations.

Sulphate of Ammonia.

A rather better demand appears to be showing itself at the moment. At the same time the March price is regarded in many directions as high; and this operates against too active a trade. The figure is expected to be lower after the close of the season. The reasons generally given for this belief is the expectation that the production of atmospheric nitrogen will be greater, and therefore more competitive. I learn that an important meeting of members of the British Sulphate of Ammonia Federation was held on the 17th inst., at which certain proposals were put forward by the German Nitrogen Syndicate with regard to the quantities of nitrogen available for export from the various producing countries for the season 1921-22. The German proposals include the suggestion that the Federation and other groups of nitrogen producers should pay Germany a large sum of money in cash, in consideration of which Germany would agree greatly to reduce her exports of nitrogen for next season. The members of the Federation unanimously rejected the German offer, and have decided under no circumstances to be parties to any payment to Germany. As regards selling policy, the meeting authorized the Executive Committee to retain a free hand to sell British production to the best advantage at home and abroad. A rather pertinent question at present is whether or not the "Reparation" Bill will prevent any cheap synthetic material from reaching us this year; but if this goes to foreign markets, it will probably have much the same effect eventually upon our prices.

From America, advices are to the effect that the quiet trading conditions in sulphate of ammonia that have marked this department for some months past are still evident. It is believed there that any possible European demand that may develop will probably reach the American operator. This view has, however, had only a slight effect on the general market. No prices of any consequence have been noted, and stocks are being liberally offered both in bulk and also in double bags.

"B.C.G.A." Conference—A Correction.—Mr. Joseph Taylor, of Bolton, writes to point out that, in the report on pp. 742-3 of the "B.C.G.A." conference at Bolton, he was wrongly reported to have stated that in 1912 he heated ten rooms with gas at a cost of 10d. per day. What he did was to refer to a system of central heating which he installed in his house in that year, and with which (after getting hot for, say, the second day) the heat could be maintained at a cost of 10d. per day by coke. This method is named the "Drop System." Most of the rooms, apart from the central heating, are fitted with gas-fires, and means to provide hot water for domestic purposes by calefactor in the summer months.



Main Matters.

THERE are Main Cookers for all conditions. While they are made in many different sizes and designs, they are all similar in that they are reliable and efficient.

Mains are the cooker experts and are equipped to deal with every class of cooker business.

Let them deal with yours.

R. & A. MAIN, LTD.

EDMONTON, N. 18, FALKIRK, &c.

Abersychan Gas Undertaking to be Purchased.—A resolution was passed at an extraordinary general meeting of the Pontypool Gas and Water Company approving a provisional agreement with the Abersychan Gas Company to acquire the Company's undertaking. It was also decided to apply to the Board of Trade for a Special Order of confirmation, and to raise £2000 of new capital.

Bothwell and Uddingston Gas-Works.—The County Council of Lanarkshire are making application to the Secretary for Scotland for a Provisional Order to enable them to acquire the undertaking of the Bothwell and Uddingston Gas Company. The Order provides for the sale or transfer of the undertaking to the County Council on such terms as may be agreed between the parties, or as may be prescribed in the Order.

Shortage of Coal at Ellesmere.—The Manager of the Ellesmere Urban District Council Gas-Works informed the Council on Wednesday last that he had great difficulty in getting a sufficient supply of coal. He had not one barrow full of coal in the works on the previous two nights, and experienced some trouble in maintaining the gas supply. After touring the district, one colliery placed two trucks on rail, and thus saved the situation.

Glasgow Gas Price.—The Sub-Committee on Finance at Glasgow recommend the raising of the price of gas by 7d. per 1000 c.ft. The revenue from coke and residual products has been reduced. A sliding-scale is suggested, ranging from 4s. 2d. applicable in the case of large consumers, to the maximum rate of 4s. 7d. for consumers of small quantities; the sliding-scale to operate after the first 10,000 c.ft. It is hoped that when the new works at Provan are completed it will be possible to revert to the 4s. rate.

Capital Outlay at Stoke-on-Trent.—At a meeting of the Stoke-on-Trent Town Council last week, the Gas Committee reported that they had considered the question of prospective capital expenditure during the next financial year, particulars of which had been asked for by the Finance Committee. They recommended that the sum of £79,500 be put forward to the Finance Committee; it being understood that the amount of £46,500 for extensions would be subject to any alterations which might become necessary, in the event of negotiations with the British Gas Light Company being brought in the near future to a satisfactory conclusion. This recommendation was approved.

British Dyestuffs Corporation.—The accounts of the Corporation for the year ended Oct. 31 show an available balance of £610,927 (against £172,504 the previous year), which includes £58,827 brought forward. There is £419,921 available for dividend on the preferred ordinary shares. This dividend is being paid at the rate of 8 p ct. per annum, less tax calculated on the amount paid up on the shares, and will absorb £216,616, leaving to be carried forward £203,305. During the two years of the Company's existence, a total amount of £593,486 has been written off the values of the Associated Companies' buildings and plants; and a sum of £289,366, including capital outlay, has been expended upon research during the same period.

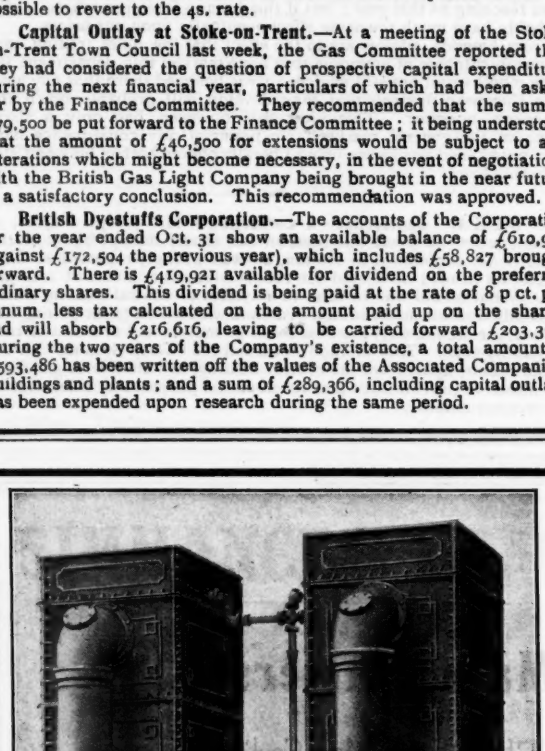
Quality of Gas at Towyn.—At a meeting of the Towyn and Aberdovey Urban District Council last week, the question of the quality of the gas was again the subject of discussion; and it was recalled that the matter had once been reported to the Board of Trade. Eventually the Council decided to write to the Gas Company saying that, if there was no improvement in the quality of the gas supplied, the matter would again be referred to the Board of Trade.

Wexford Gas Dispute.—Trouble has arisen in the Wexford Gas-Works through objection taken by the local branch of the men's union to a fitter's apprentice being dismissed for refusing to take in meter's from consumers' premises; this being held to be part of the slot collector's duty. Other unions are in sympathy with the men. Meanwhile, a demand for increased wages for the clerks and slot collector has led to a nominal concession, which has been declined.

Waste Heat and Gas Company.—The profit of Waste Heat and Gas Electrical Generating Stations for the year ended Jan. 31, after deducting administration expenses, was £34,439; and the Directors recommended the payment of a dividend of 8 p.ct. There was considerable capital expenditure during the year, mainly in connection with the new power station at Horden. The reserve account and redemption funds in respect of plant supplied on hire-purchase terms amount to nearly £150,000.

Coke Beats Petrol in Lorry Test.—The "Sentinel News" gives some valuable information regarding the performances of a "Sentinel" coke-fired steam wagon and a petrol lorry on a loaded run. The total useful loads of both wagons was 5 tons 7 cwt., and the total distance of the trip was 240 miles. The amount of petrol used was 36 gallons; of coke, 18 cwt. 3 qrs. 25 lbs. The total cost of fuel for the journey was £2 12s. 3d. for the "Sentinel," and £6 12s. for petrol. The fuel per mile of complete journey for the "Sentinel" was 9·4 lbs., and for the petrol 0·159 gallon. The cost for fuel per mile was 2·77d. for the "Sentinel" and 7·7d. for petrol. These costs are based on coke at 55s. per ton and petrol at 3s. 8d. per gallon. In time, also, the "Sentinel" was a long way ahead.

Australian Gas Light Company.—At last month's meeting of the Company in Sydney, the Directors reported that the profits for the half year ended Dec. 31, including the balance brought forward, amounted to £118,673. Out of this, the Directors recommended the payment of a dividend for the six months of 4 p.ct., which would absorb £85,200, and leave a balance to carry forward of £33,473. It was found necessary, owing to increased wages and costs of material, to apply to the proper authorities for permission to make an increased charge for gas and for the street lighting service. As the result of the inquiry by the Royal Commissioner (Mr. Justice Wade), the standard price of gas was raised to 5s. 9d. per 1000 c.ft., as from Nov. 24; while increased charges for lighting and maintaining the street lights in the various municipalities were sanctioned by the Necessary Commodities Commission to come into operation on Jan. 1 last.



"BEARSCOT" TUBING IN WATER CONDENSERS EXTENDS UPWARDS OF 130 MILES.'

WATER-COOLED CONDENSERS

AS FITTED WITH THE **"BEARSCOT"** SAFE JOINT TUBE.

With our Central Port Fourway Valve the Condensers may be Reversed or Bye-passed as Required.

PARTICULARS WILL BE SUPPLIED UPON APPLICATION TO—

R. & J. DEMPSTER, LD.

Telegrams: "Scrubber Manchester"

MANCHESTER.

LONDON OFFICE:

34, VICTORIA STREET, WESTMINSTER, S.W.1.

Mr. T. Banyard, who has been in the employ of the British Gas Light Company at Hull for over 40 years (27 years as the foreman carbonizer), was presented by his fellow-workmen, on his retirement, with a walking stick, a tobacco pouch, and a briar pipe. The presentation was made by Mr. W. Boot, another long-service employee.

Two youths who were fined 20s. each, at Whitehaven. as an example to others who amused themselves by smashing street-lamps, were stated to have thrown stones at lamps, doing damage to an extent of £3 3s. 8d. The Town Clerk stated that the damage to street-lamps suffered by the Council last year amounted to nearly £400.

The General Electric Company, Ltd. ["G.E.C."] intimate that, as from Monday, April 4, their head office, sales departments, and stores will be situated at Magnet House, Kingsway, London, W.C. 2. Their new telephone number is "Regent, 7050"—50 lines. Until further notice, the show-rooms of the Company will remain at No. 67, Queen Victoria Street.

A copy is to hand of the British Engineers' Association (Incorporated) Classified Directory of Members for 1921. The book is a useful publication, when it is remembered that the object of the Association is to provide a central national organization in the engineering industry for the protection and promotion of British engineering interests at home and abroad. The offices of the Association are at No. 32, Victoria Street, Westminster, S.W.

Messrs. A. & W. Richards announce an issue, by order of the Directors, of £20,000 of 7 p.ct. redeemable debenture stock in the Tunbridge Wells Gas Company. The issue price is £95 per £100; and the stock is to be redeemed at par on July 1, 1931. The yield, allowing for redemption, is thus £7 15s. 6d. p.ct. An agreement to purchase the gas undertaking of the Southborough Urban District Council has been entered into; and the new capital now being raised will be utilized partly in payment therefor, and partly for extension of the Company's existing works and mains rendered necessary by the growth in the demand for gas.

STOCK MARKET REPORT.

WITH only four working days before it, and with the Easter holiday thereto supervening, the Stock Exchange last week could not be expected to accomplish any speeding-up to the dull paucity of business which has so long oppressed it. But one welcome change came over the scene when, on Wednesday, a brighter tone began to open; and this was so fortified next day that the House closed in a fairly cheerful mood.

The gilt-edged market was well supported. Home Government issues—except Victory—advanced, Friday's figures for the big four being: Consols 48¼-48⅝, War Loan 86½-87½, Funding 71¼-71½, Victory 77¼-77¾. Bonds were in good demand and Corporation issues firmer. Indian stocks advanced. Home Rails, after an uncertain start, wound up very firm. Canadian and Argentine were variable.

In the Foreign Market, there was a good deal of see-sawing, particularly in Russians. Argentines, Egyptian, and Chilian were among the steadiest.

The Miscellaneous Market, on the whole, presented more points of recovery. Prices in Rubber were better; but Oils were rather chequered. Among the most favoured were Shipping, Textiles, and Iron and Steel.

Business in the Gas Market was on a much reduced scale, as was only to be expected, and was not lighted-up by any illuminating feature. The general characteristic was unchanged steadiness. In the London Companies, Gas Light and Coke and South Metropolitan changed at the previous week's figures; but Commercial 4 p.ct. was a point lower. In Suburban and Provincial, the only move was a drop of 5 in Lea Bridge. In Continentals, the quotation of Imperial was drawn in closer, and that of the debenture was raised 2. European had a further rise. Primitivas were quiet and unchanged.

Bargains done for cash during the week were as follows: On Monday, Gas Light ordinary 54½, 54⅝, 54¼, 55, 55¼, 55⅜, ditto maximum 41, 41⅛, 42, ditto preference 58, Imperial Continental 163, 163½, 163⅛, 163¾, 164, 164½, 165, Monte Video 70⅛, 71, 71⅛, Primitiva 8s. 6d., 9s., ditto preference 24s., 24s. 6d., South Metropolitan 62½, 63, 63⅛, 63½, 63⅝, 64, Harrow and Stanmore 5 p.ct. 51, 52½. On Tuesday, Alliance and Dublin 40¾, 40⅞, Brentford "A" 52, 53, European 6⅞, 6⅝, Gas Light ordinary 54⅜, 55⅛, 55½, ditto debenture 47, Imperial Continental 163, 163¼, 164½, Monte Video 70¼. Primitiva preference 26s., ditto debenture (1911) 38½, South Metropolitan 63, 64, Wandsworth Wimbledon 46¾, 47½, Brighton and Hove 6 p.ct. "B" preference 80. On Wednesday, Gas Light ordinary 54⅜, 55½, 55⅜, 55½, ditto debenture 47, Imperial Continental 163, 164, 164½, ditto debenture 77½, 78, Monte Video 70½, Oriental 91, Primitiva debenture 68½, South Metropolitan 62½, 63, South Suburban 57, Tottenham "B" 51½, North Middlesex 5 p.ct. preference 61, 61½. On Thursday, Bournemouth "B" 8⅜, 8⅝, Commercial 4 p.ct. 50, ditto debenture 44, 45, Gas Light ordinary 54⅜, 55½, Imperial Continental 162, 162½, 163½, Monte Video 70, South Metropolitan 63½, Newport, Monmouth 5 p.ct. debenture 60½, 61, Colombo 7½, 7 9/16. The next day, being Good Friday, was a *dies non*.

In the Money Market, there was a sharp demand which increased daily and reached a climax on Thursday. Discount rates held very firm. Silver showed little variation and now stands at 33½d. The Bank rate remains at 7 p.ct., as fixed on April 17 last.

For stealing 164 lbs. of coal, value 3s. 9d., from the Tenbury Gas-Works, William Clark, stoker, was fined 15s.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.c.					
182,049	Stk.	Mar. 11	4	4%	Aldershot 4 p.c. Pref.	...	53—58*	..
1,551,868	,,	Oct. 14	2½	3 1/3%	Alliance & Dublin Ord.	59—64	38—43	40¼—40½
374,000	,,	Jan. 13	4	4%	Do. 4 p.c. Deb.	76—79	47—52	...
280,000	5	Oct. 28	7½	8%	Bombay, Ltd.	3½—6½	4—4½	...
100,000	5	Feb. 25	16	5%	Bournemouth Gas and Water — 5 p.c.	...	7½—8½	...
383,110	10	,,	7	7%	Bournemouth Gas and Water — B 7 p.c.	15—15½	8½—9½	8⅛—8½
115,000	10	,,	6	6/-	Bournemouth Gas and Water — Pref. 6 p.c.	13½—14	7½—8½	...
162,065	—	Dec. 30	—	4%	Bournemouth Gas and Water — 4 p.c. Deb.	...	55—60	..
992,045	Stk.	Feb. 25	14	30/-	Brentford A Consolid.	261—266	50—55	52—53
734,920	,,	,,	11	26/3	Do. B New	204—209	47—52	...
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	68—73	...
221,400	,,	Dec. 15	4	4%	Do. 4 p.c. Deb.	91—93	57—59	...
214,775	,,	Mar. 11	11	7½%	Brighton & Hove Orig.	208—213	95—105*	...
244,200	,,	,,	8	5⅓%	Do. A Ord. Stk.	154—159	63—75*	...
1,287,500	Stk.	July 29	5	5%	Bristol 5 p.c. max.	...	...	...
530,000	20	Sept. 15	12½	10%	British	44—45	22—24	...
120,000	Stk.	Dec. 30	4	4%	Do. 4 p.c. Deb. Stk.	88—90	50—55	...
245,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	85—87	37—40	...
100,000	10	May 27	—	—	Cape Town & Dis., Ltd.	1½—2½	7—7½	...
100,000	10	Dec. 10	—	4⅓%	Do. 4½ p.c. Pref.	4—6	5—6	...
100,000	Stk.	Dec. 30	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	55—60	...
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	...	...
1,513,280	,,	Feb. 25	5/9/4	30/-	Commercial 4 p.c. Stk.	106—108	50—53	50
560,000	,,	,,	5½	26/3	Do. 3½ p.c. do.	103—105	47—52	...
475,000	,,	Dec. 15	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	42—45	44—45
800,000	,,	Dec. 11	4	—	Continental Union Ltd.	76—79	20—25	...
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	115—118	30—40	...
51,600	—	Feb. 5	15	10%	Croydon A 10 p.c.	...	120—130	...
278,400	—	,,	12	7%	Croydon B and C 7 p.c.	..	90—100	...
492,270	Stk.	—	6	4½%	Derby Con. Stk.	123—125	...	..
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	...	...
1,002,180	10	Jan. 29	10	5/0	European, Ltd.	17½—18	6½—7½	6½—6⅞
16,298,975	Stk.	Feb. 10	4/17/4	30/-	Gas Light and Coke — 4 p.c. Ord.	98—102	54—57	54⅜—55½
2,600,000	,,	,,	3½	26/3	Gas Light and Coke — 3½ p.c. max.	76—79	40—43	41—42
4,062,235	,,	,,	4	4%	Gas Light and Coke — 4 p.c. Con. Pref.	96—99	56—59	58
4,674,850	,,	Dec. 15	3	3%	Gas Light and Coke — 3 p.c. Con. Deb.	72½—74½	46—49	47
130,000	,,	Dec. 11	10	10%	Gas Light and Coke — 10 p.c. Bonds.	...	...	...
82,500	,,	Mar. 11	5	3⅓%	Hastings & St. L. 5 p.c.	...	53—58*	...
258,740	,,	,,	3½	2⅓%	Do. 3½ p.c.	87—89	47—50*	...
70,000	10	May 13	11	8%	Hongkong & China, Ltd.	16½—16¾	8½—9½	...
86,600	Stk.	Mar. 11	9	5⅔%	Hornsey 7 p.c.	...	75—85*	...
131,000	,,	Aug. 12	7½	3⅓%†	Ilford A and C	151—154	77—81	...
65,780	,,	,,	6½	2⅔%†	Do. B	113—118	57—62	...
65,500	,,	Dec. 30	4	4%	Do. 4 p.c. Deb.	92—94	54—56	...
4,940,000	,,	,,	9	4½%	Imperial Continental	150—160	161—166	162—165
1,235,000	,,	Feb. 10	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	75—80	77½—78
235,242	,,	Sept. 15	6½	3 1/4%†	Lea Bridge Ord. 5 p.c.	119—121	60—65	...
2,498,903	,,	Feb. 26	10	37/6	Liverpool 5 p.c. Ord. — A.	211—213	...	...
					Liverpool 5 p.c. Ord. — B.	146—148	...	...
306,083	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	...	...	...
165,736	,,	Feb. 25	7/3/6	3⅓%	Maidstone 5 p.c.	...	52—57	...
73,000	5	June 11	6	3%	Malta & Mediterranean	4½—4¾	1½—2½	...
250,000	100	Oct. 1	4½	4½%	Met. of Melbourne 4½ p.c. Deb.	99—101	86—93	..
341,920	Stk.	Nov. 26	4	6%	Monte Video, Ltd.	11½—12	68—73	70—71½
1,875,892	,,	Feb. 25	4½	3⅓%	Newcastle & Gateh'd Con.	98½—99½	58½—59½	...
529,705	,,	Dec. 30	3½	3½%	Do. 3½ p.c. Deb.	82—83	50—51	...
15,000	10	Mar. 11	—	1⅔%	North Middlesex 10 p.c.	...	12½—13*	..
55,940	10	,,	7/14/0	5⅔%	,, ,, 7 p.c.	14—15	7—7½*	...
300,000	Stk.	Nov. 26	8	8%	Oriental, Ltd.	117—122	90—100	91
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7½—7¾	2—3	...
60,000	50	Feb. 25	13	7½%	Portsea Island, B	128—131	65—70	...
100,000	50	,,	12	6¾%	Do. C	118—121	50—55	...
249,980	5	April 29	8	—	Primitiva Ord.	5⅜—6	1—1½	8/6—9/-
499,960	5	June 26	5	—	Do. 5 p.c. Pref.	4¾—5	1½—1¾	24/—26/-
521,600	100	Dec. 1	4	4%	Do. 4 p.c. Deb.	91—93	67—69	68½
600,000	Stk.	Jan. 27	4	4%	Do. ,, ,, 1911	...	37—40	38½
346,198	,,	Dec. 30	4	4%	River Plate 4 p.c. Deb.	85—87	37—40	...
150,000	10	Sept. 30	6	6/-	San Paulo — 6 p.c. Pref.	10½—11	6½—7½	...
125,000	50	Jan. 3	5	5%	San Paulo — 5 p.c. Deb.	47—49	37—39	...
135,000	Stk.	Aug. 27	10	5%	Sheffield A	223—224	66—69	...
209,984	,,	,,	10	4⅔%	Do. B	222—224	66—69	...
523,500	,,	,,	10	3⅓%	Do. C	220—222	63—65	...
133,201	Stk.	Sept. 15	4	4%	Shrewsbury 5 p.c.	...	...	...
50,000	10	Sept. 30	9	9%	South African	10½—11½	10½—11½	...
6,609,895	Stk.	Feb. 10	5/14/0	5%	South Met. Ord.	111—113	62—65	62½—64
250,000	,,	Jan. 13	—	5%	Do. Red. Pref.	...	90—92	...
1,895,445	,,	,,	3	3%	Do. 3 p.c. Deb.	72½—74½	42—48	...
224,820	,,	Feb. 25	3½	7⅓%	South Shields Con. Stk.	157—159	86—88	...
1,087,795	,,	,,	6	3⅓%	S'th Suburb'n Ord. 5 p.c.	114—116	56—61	57
247,558	,,	Dec. 30	5	5%	Do. 5 p.c. Deb. Stk.	116—118	65—70	...
647,740	,,	Nov. 12	7½	3⅓%	Southampton Ord.	99—102	55—58	...
121,275	,,	Dec. 30	4	4%	Do. 4 p.c. Deb. Stk.	...	57—59	...
120,000	,,	Feb. 25	—	3⅓%	Tottenham — A 5 p.c.	135—138	57—62	...
732,475	,,	,,	6	2⅔%	Tottenham District — B 3½ p.c.	115—117	50—55	51½
181,255	,,	Dec. 15	4	4%	Tottenham District — 4 p.c. Deb.	87—89	55—58	...
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	...
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	45—50	...
236,476	Stk.	Feb. 25	5	3⅓%	Tynemouth 5 p.c. max.	108½—109	68—70	...
					Wandsworth, Wimbledon, and Epsom—			
30,000	,,	Feb. 25	8½	47/6	Wandsworth A 5 p.c.	151—156	75—80	...
255,636	,,	,,	6½	32/6	Do. B 3½ p.c.	129—134	53—58	...
108,075	,,	,,	—	33/3	Do. C	...	50—55	...
140,865	,,	,,	—	33/3	New Ordinary	...	50—55	..
552,000	,,	,,	6½	26/3	Wimbledon 5 p.c.	117—122	45—48	46½—47½
98,000	,,	,,	6½	32/6	Epsom 5 p.c.	121—126	50—55	...
88,416	—	Dec. 30	3	3%	5 p.c. Deb. Stk.	66—69	40—45	

* Ex Div. † Next dividend will be at this rate.

The Rowley Regis Urban District Council, at their meeting last Wednesday, decided to instruct the Surveyor to request the Gas Companies to paint the standards of island lamps with bands of red and white, in order to diminish the liability of collision, should any lamps become extinguished during the night.

At Doncaster, John Cust, an ex-soldier, who was demobilized in South Africa, and came to this country at the end of last year on a visit, was found dead in a bedroom at the Y.M.C.A. headquarters, where he had been staying. Everything pointed to death being due to gas-poisoning, as the burner was turned on, and the gas escaping.

The Directors and management of the James Keith and Blackman Company, Ltd., were entertained by the employees of the Company's London works at a complimentary dinner at the London Tavern, Fenchurch Street, on Saturday the 19th inst. Some 200 of the London works employees were present; and the whole of the Directors and management were invited. But Mr. George Keith (the Managing-Director), owing to the recent death of his father, Mr. James Keith, was unable to be present. Mr. C. S. Burden, who presided (assisted by Mr. W. J. Cook in the vice-chair), proposed the toast of "The James Keith and Blackman Company, Ltd.," which was responded to by Mr. T. W. Alsop (the Chairman of the Company). The organizers are to be congratulated on the result of their efforts, as not only did the gathering prove to be one of the most successful and interesting events in the history of the Company, but it also demonstrated in an unmistakable manner the excellent understanding existing between the London workers and the management.

It was reported to a meeting of the Rowley Regis Urban Council on Wednesday last that, in their area at Whiteheath, the Oldbury authority had laid a gas-main. The Clerk was directed to communicate with Oldbury, and order them to remove the main forthwith, and satisfactorily to restore the highway.

THE THERM PRICE CALCULATOR

(Protected.)

A SLIDE RULE designed by Mr. H. R. ASKEW, Assoc.M.Inst.C.E., B.Sc. (Eng.), &c., for quickly and accurately converting "Price per Thousand" into "Price per Therm," and *vice versa*.

AN INVALUABLE ADJUNCT TO EVERY GAS OFFICE.

For Description, see "JOURNAL," Jan. 12, p. 88.

Price 10/6, post free.

Walter King, "JOURNAL" Offices, 11, Bolt Court, Fleet Street, LONDON, E.C. 4.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer—not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON TUESDAY, to ensure insertion in the following day's issue.

Orders to Alter or Stop PERMANENT ADVERTISEMENTS should be received by the FIRST POST on Monday.

UNDISPLAYED ADVERTISEMENTS: Situations Wanted, Six Lines and under (about 36 words) 3s.; each additional Line, 6d. Situations Vacant, Apparatus Wanted and for Sale, Contracts, Public Notices, &c., 9d. per Line—minimum, 4s. 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

		ONE YEAR.	HALF-YEAR.	QUARTER
United Kingdom	Advance Rate:	35/- ..	18/- ..	10/-
	Credit Rate:	40/- ..	21/- ..	11/6
Abroad (to the Postal Union) Payable in Advance		40/- ..	22/6 ..	12/6

In payment of subscriptions for "JOURNALS" sent abroad, Post Office Orders or Bankers' Drafts on London only are accepted.

All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C. 4.

Telegrams: "GASKING, FLEET LONDON." Telephone: Holborn 6857.

OXIDE OF IRON

FOR SALE OUTRIGHT, OR ON LOAN.

SPENT OXIDE

PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LTD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.2.

"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for Gas-Works.
ANDREW STEPHENSON, Gresham House, Old Broad Street, LONDON, E.C. "Volcanism, London."

TAR WANTED.

BEFORE entering into any arrangement for the DISPOSAL of your Production, it will be to your interest to communicate with

BROWNHILLS CHEMICAL WORKS CO.,
near WALSALL.

SULPHURIC ACID.

SPECIALLY prepared for the manufacture of SULPHATE OF AMMONIA.

SPENSER CHAPMAN & MESSEL, LTD.,
with which is amalgamated WM. PEARCE & SONS, LTD.,
Mark Lane, LONDON, E.C. Works—SILVERTOWN.
Telegrams—"HYDROCHLORIC, FEN, LONDON."
Telephone—1588 AVENUE (3 lines).

BRITISH LUX.
AN EXCELLENT PURIFYING MATERIAL.
Features;—
(a) Porosity equal to Best Bog Ore.
(b) Contains Ferric Hydrate in an active state, thus resembling "LUX."
(c) Prepared in good mechanical condition ready for Purifiers.
DANIEL MACVIE, 1, NORTH ST. ANDREW STREET, EDINBURGH.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E. 1.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 815 Oldham, and 2412 Hop, London.
Telegrams—
"BRADDOCK, OLDHAM," and "METRIQUE, LAMB, LONDON."

TULLY GAS PLANTS, LTD.,
SOLE MANUFACTURERS OF
TULLY'S Patent Carburetted Hydrogen PLANT.
MILLGATE, NEWARK-ON-TRENT.
London Office: 39, VICTORIA STREET, S.W. 1.

SULPHATE OF AMMONIA
SATURATORS and all LEAD and TIMBER WORK in connection with Sulphate Plants.
We Guarantee promptness with efficiency for Repairs.
JOSEPH TAYLOR (SATURATORS), LTD., Chemical Plant Engineers, Blackhorse Street Mills, BOLTON.
Telegrams—"SATURATORS, BOLTON." Telephone 848.

SPENCER'S Patent Inclined HURDLE GRIDS.

THE very best Patent Grids for Holding Oxide Lightly.
See Illustrated Advertisement, Feb. 23, p. 498.

BRITISH GAS PURIFYING MATERIAL.

ENGLISH BOG ORE AND NATURAL HYDRATED OXIDE OF IRON,
SPENT OXIDE BOUGHT.

BRITISH GAS PURIFYING
MATERIALS CO., LTD.
(W. T. P. CUNNINGHAM, Proprietor.)
13, ARCADIAN GARDENS, WOOD GREEN, LONDON, N. 22.
Telegrams: "Bripurimat, Wood, London."
'Phone: Palmers Green 608.

OXIDE OF IRON.
SPENT OXIDE BOUGHT.

BALE & CHURCH, LTD.
33, ST. MARY AT HILL, LONDON, E.C.3.
Phone: Avenue 6680.

"TORTO" FIRE CEMENT.

BALE & CHURCH, LTD.
33, ST. MARY AT HILL, LONDON, E.C.3.
Phone: Avenue 6680.

"KLEENOFF," THE COOKER CLEANSER.
Tins for Sale to Consumers.
In Bulk for Works Use.

BALE & CHURCH, LTD.
33, ST. MARY AT HILL, LONDON, E.C.3.
Phone: Avenue 6680.

GEORGE WILSON GAS METERS, Ltd.
for
GAS-METERS, ORDINARIES, SLOTS, AND REPAIRS,
Foleshill Road, COVENTRY.
Telephone: 596. Telegrams: "GASMETER,"
and at 7/9, Grosvenor Street, C.on M., MANCHESTER.
Telephone: 3214 CITY. Telegrams: "GASMETER."
and 46 & 47, Auckland Street, LONDON, S.E. 11.

MEWBURN, ELLIS, & CO.,
CHARTERED PATENT AGENTS AND TRADE MARK AGENTS,
70 & 72, Chancery Lane, London, W.C. 2.
Telegrams: "Patent, London." Phone 243 Holborn.
And 3, St. Nicholas Buildings, Newcastle-on-Tyne.

J. E. C. LORD (Manchester), Ltd.,
Ship Canal Tar Works, Weaste, Manchester.
Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

INVENTIONS PATENTED. TRADE MARKS REGISTERED.
Advice and Handbook free. 35 years' references. Gas Patents a Speciality. KING'S PATENT AGENCY, Ltd. (Director, B. T. King, A.I.M.E., British and U.S. Regd. Patent Agent), 149A, QUEEN VICTORIA STREET, LONDON, E.C. 4.